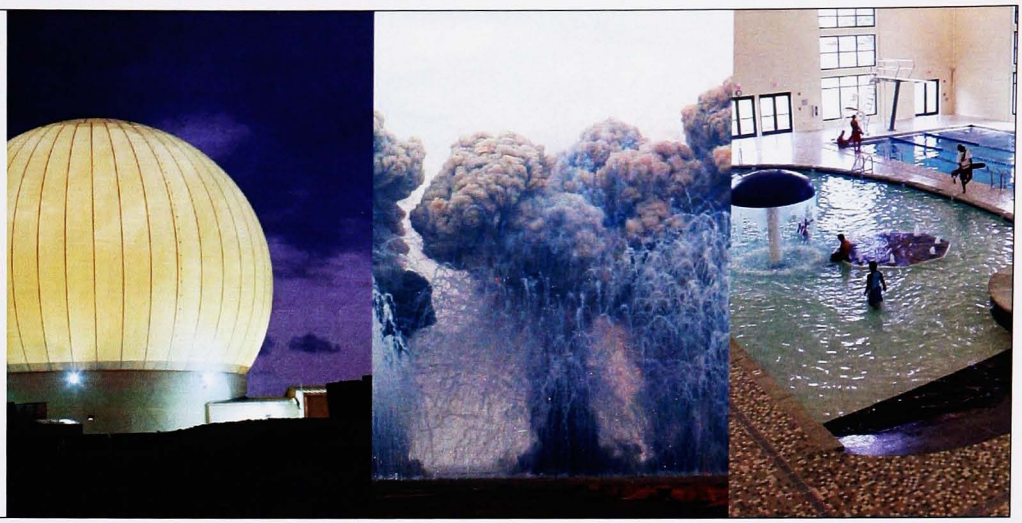

ONE DOOR to the CORPS:
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HISTORICAL UPDATE, 1998-2007

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Prepared by:

F. Patricia Stallings and Edward G. Salo
Senior Historians

Brockington and Associates, Inc.
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DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF

Foreword

To the Members and Friends of the Huntsville Center:

The history you are about to read is a summary of the great work that the Huntsville Engineering and Support Center has accomplished over the last 10 years. In these few pages, it is impossible to fully capture the magnitude of the effort and energy that the hundreds of dedicated professional Center personnel have expended on behalf of the nation. Their work directly improved the lives of Military Members, their Families, other Department of Defense and non-DoD personnel around the world. The employees of the Center do this work not for fame or fortune, but because they know their effort is helping to improve the quality of life for our Armed Forces, improving quality and efficiencies in our numerous governmental agencies we support, and helping to provide vital security for our nation through our numerous regional and global programs.

You will enjoy learning about the many, many changes and challenges the Huntsville Center has embraced over the past 10 years. The Center began to focus on quality for the customers and was the recipient of numerous Army-level quality awards. This focus on quality resulted in the Center becoming one of only a few organizations in the US Army Corps of Engineers to have its Quality Management System ISO 9000 certified in 2007. Organizationally, the Center continued to evolve in order to better serve the customers and stakeholders. For instance, in 2007, it gained the former Hazard, Toxic and Radioactive Waste Center of Expertise in Omaha, merging with the Military Munitions CX to form the Environment and Munitions Center of Expertise (EM CX). Global War on Terrorism programs were instituted after September 11, 2001. Other CXs were established as well, such as the Installation Support CX. New programs started such as the billion dollar Coalition Munitions Clearance (CMC) program in Iraq. And hundreds of Center personnel stepped forward to deploy to support the GWOT efforts in rebuilding Iraq and Afghanistan, as well as rebuilding in America after Hurricanes Katrina and Ike.

Any organization is only as good as its people. Even a cursory reading of this short history will demonstrate that the Huntsville Engineering and Support Center's personnel are among the best in the nation. They are the driving force that is taking the Center from a good organization to a GREAT organization. Building Strong!

Sincerely,

Larry D. McCallister
Colonel, USA Retired

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Colonel (Ret.) Larry D. McCallister, PhD, P.E., PMP
C. Robert Britton, PMP
Sharon H. Butler
James M. Cox
Lawrence P. Delaney, R.A.
Charles "Dave" Douthat
Wayne H. Galloway
Patrick M. Haas, P.E.
Toni S. Hamley
Brenda L. Hatley
Linda M. Hocker
Emmett L. Hopkins
Jerry M. Hubbard
William O. Johnson
Thomas A. Kenney
Steven G. Light, P.E., PMP
John C. Lonnquest
John M. Loyd
John W. Mayes
Bradford L. McCowan
Fawzy Makar
John D. Matthews
Suzanne G. Murdock
Betty Neff
Robert Nore, P.E.
Cyndee L. Oleyte
John C. Potter, Phd.
Angela Rackard
Mirko Rakigjija
Jim Reynolds
Boyce L. Ross, P.E.
William J. Sargent
Linda Sisk
Michael E. Stovall, PhD, P.E.
Richard M. Suever
Antonio Torres, P.E., M.ASCE
Wes Turner
Debra Valine
Chaquandra K. Wilson
Carol Youkey, P.E., PLS
Sandi Zebrowski, P.E.

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LIST of ACRONYMS

AAP	Army Ammunition Plant
ABMs	Anti-Ballistic Missiles
ACOE	Army Communities of Excellence
ACPP	Access Control Point Program
ACPEP	Access Control Point Equipment Program
ACWA	Assembled Chemical Weapons Alternatives
AEC	Army Environmental Command
AFCS	Army Facilities Components System
AFB	Air Force Base
AFIP	Armed Forces Institute of Pathology
AIE	Automated Installation Entry
AMP	Army Metering Program
APAP	Army Pollution Abatement Program
APIC	Army Performance Improvement Criteria
ARMP	Army Range Modernization Program
ASCIM	Assistant Chief of Staff for Installation Management
ASP	Ammunition Supply Point
ASR	Archive Search Reports
BIM	Building Information Modeling
BMD	Ballistic Missile Defense System
BOCC	Building Operation Command Center
BRAC	Base Realignment and Closure
BTU	British Thermal Unit
CAEADS	Computer-Aided Engineering and Architectural Design Systems
CAL	Central Chemical Weapons Destruction Analytical Laboratory (CAL)
CAMDS	Chemical Agent Munition Disposal System
CEA	Captured Enemy Ammunition
CENTCOM	U.S. Army Central Command
CERCLA	Comprehensive Environmental Response and Compensation Liability Act
CERL	Construction and Engineering Lab
CFSC	Community and Family Support Center
CJTF-7	Combined Joint Task Force-7
CMA	Centrally Managed Administrative
CMA	Chemical Materials Agency
CMC	Coalition Munitions Clearance
CMR	Command Management Review
CONUS	Continental United States
COS	Centers of Standardization
CPW	Center for Public Works

CSDP	Chemical Stockpile Disposal Program
CSI	Customer Satisfaction Index
CTR	Cooperative Threat Reduction
CTT	Close, Transferred, and Transferring
CW	Chemical Weapon
CWC	Chemical Weapons Convention
CX	Center of Expertise
DA	Department of the Army
DERP	Defense Environmental Restoration Program
DGP	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DOD	Department of Defense
DOE	Department of Energy
DPW	Directorates of Public Works
DRI	Defense Reform Initiative
DTRA	Defense Threat Reduction Agency
ECBC	Edgewood Chemical Biological Center
EEAP	Energy Engineering and Analysis Program
EE/CA	Engineering Evaluation/Cost Analysis
EKO	Engineering Knowledge Online
EM CX	Environmental and Munitions Mandatory Center of Expertise
EOD	Explosive Ordnance Disposal
EODT	Explosive Ordnance Disposal Technology, Inc.
EPA 2005	Energy Policy Act of 2005
ERDC	Engineer Research and Development Center
ESPC	Energy Savings Performance Contracting
ESS	Electronic Security Systems
FRP	Facilities Reduction Program
FRR	Facilities Repair and Renewal
FUDS	Formerly Used Defense Sites
FY	Fiscal Year
G-3	Division and Corps Level Operations Staff
G&A	General and Administrative
GAO	General Accounting Office
GB	NATO designation for Sarin Nerve Gas
GFP	Government Furnished Property
GIS	Geographic Information System
GS	Grade Structure
GSA	General Services Administration
GWOT	Global War on Terror

HFO	Health Facilities Officer
HNC	U.S. Army Engineering and Support Center, Huntsville
HQDA	Headquarters, Department of the Army
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HTRW	Hazardous, Toxic, and Radioactive Waste
HVAC	Heating, Ventilating, and Air Conditioning
ICBMs	Intercontinental Ballistic Missiles
IDBB	Integrated/Design/Bid/Build
IDIQ	Indefinite-Delivery, Indefinite-Quantity
IED	Improvised Explosive Device
IMA	Installation Management Agency
IMCOM	Installation Management Command
IMMSS	Integrated Modular Medical Support Systems
ISCX	Installation Support Center of Expertise
KERO	Kuwait Emergency Recovery Office
LCPM	Life Cycle Project Manager
MAD	Mutually Assured Destruction
M^2S^2	Military Munitions Support Services
MCX	Mandatory Center of Expertise
MCX-OE	Mandatory Center of Expertise for Ordnance and Explosives
MEC	Military and Explosives of Concern
MEDCOM	Medical Command
MESH	Mapping Explosive Safety Hazards
MFDO	Medical Facilities Design Office
MFMCES	Medical Facilities Mandatory Center of Expertise and Standardization
MILCON	Military Construction
MIRV	Multiple Independently Targetable Reentry Vehicles
MOU	Memorandum of Understanding
MPBSCP	Munitions Productions Base Support Construction Program
MM-CX	Military Munitions Center of Expertise
MMRP	Military Munitions Response Program
MOUT	Military Operations in Urban Terrain
MRR	Medical Repair and Renewal
MWR	Morale, Welfare, and Recreation
OACSIM	Office of the Assistant Chief of Staff for Installation Management
OCE	Office of the Chief of Engineers
OCONUS	Outside Continental United States
OE	Ordnance and Explosives
OEF	Operation Enduring Freedom (Afghanistan)
OIF	Operation Iraqi Freedom
OMB	Office of Management and Budget

OMEE	Operations and Maintenance Engineering Enhancement
O&M	Operations and Maintenance
OSD	Office of Secretary of Defense
PMCD	Program Manager for Chemical Demilitarization
PWTBs	Public Works Technical Bulletins
QP	Quality Procedure
RAB	Restoration Advisory Board
RACER	Remedial Action Cost Engineering Requirements
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RDX	A Type of Conventional High Explosive
REP	Rappahannock Electric Cooperative
RMA	Royal Military Academy [Belgian]
RTLP	Range and Training Land Program
SALT I	Strategic Arms Limitation Talks/ Treaty I
SCWO	Super Critical Water Oxidation
SES	Senior Executive Service
TAC	Transatlantic Programs Center
TAG	Technical Advisory Group
TAPP	Technical Assistance for Public Participation
TQM	Total Quality Management
TTFW	Tetra Tech-Foster Wheeler, Inc
UMCS	Utility Monitoring and Control Systems
UMCS-MCX	Utility Monitoring and Control Systems Mandatory Center of Expertise
UPH	Unaccompanied Personnel Housing
USACE	United States Army Corps of Engineers
USAE	USA-Environmental, Inc.
USAF	United States Air Force
USS	Utility Systems Surveys
USATHMA	United States Army Toxic and Hazardous Materials Agency
UXO	Unexploded Ordnance
VA	Veterans Affairs
WI	Work Instruction
WTU	Warrior Transition Unit

From its beginning, Huntsville Center had no geographical boundaries, and unlike other U.S. Army Corps of Engineers (USACE) organizations, it had a singular mission. In 1967, at the height of the Cold War, the Corps assigned then Huntsville Division all design and construction activities for the U.S. Army's SENTINEL/SAFEGUARD Ballistic Missile Defense (BMD) System. Over the next four decades, Huntsville emerged as the Corps' primary management organization for complex nationwide programs requiring advanced technology and centralized management. The documentation of the Center's workload, typically completed in five-year increments, has been a monumental undertaking by historians James Kitchens, Louise Heidish, Louis Torres, and Damon Manders.[1] The current historical update merely provides the latest chapter, with the added challenge of covering a 10-year period in which the United States entered a Global War on Terror (GWOT).

The Huntsville Division was created in the context of the U.S. military's search for a shield from the threat of nuclear weapons. Soon after the Soviets acquired nuclear weapons in the 1950s, the U.S. military instituted the recommendations of the Killian Report, an assessment of the United States' ability to maintain its deterrence policy. The report emphasized the need to develop technology and adopt a strategy that would permit the United States to survive and respond to a Soviet nuclear attack. This strategy led to what was known as Mutually Assured Destruction (MAD), a concept based on the notion that peace between the United States and Soviet Union could be achieved by obtaining a balance in the nuclear arms race, thereby creating a stalemate between the two nations. The MAD logic was based on the premise that as long as either side had enough nuclear weaponry to survive an attack and launch a counterstrike, neither nation would be willing to initiate the first strike. This led to a constant struggle between the two superpowers to acquire more nuclear arms, either to gain the advantage or to keep up with the other. Both superpowers worked to develop new weapons technologies such as multiple independently targetable reentry vehicles (MIRVs), antiballistic missiles (ABMs), and cruise missiles as a means to break the MAD deadlock. During the 1960s, both sides looked for advantages and ways to tip the balance of power.[2] In 1966, the Soviets deployed the first ABM system and risked the uneasy peace brought about by MAD. In that same year, the United States deployed the first MIRVs on Intercontinental Ballistic Missiles (ICBMs). This new weapon allowed a greater number of warheads, each targeted at a separate location, to be used in a single missile.

Based on the threat by Soviet ICBMs and intelligence that Communist China could deploy ICBMs by the early 1970s, Secretary of Defense Robert McNamara ordered the U.S. Army to develop a deployment plan of its own, using existing SPRINT and SPARTAN interceptors. In the summer of 1967, the Army prepared a plan that called for several Perimeter Acquisition Radars (PARs) located across the northern parts of the United States and Alaska to perform the long-range detection. The PARs would support several short-range Missile Site Radar (MSR) and SPARTAN batteries in the continental United States and Alaska, and one MSR and SPRINT

battery in Hawaii. On 18 September 1967, Secretary McNamara announced the decision to deploy the SENTINEL system as a defense shield to intercept missiles.[3]

To oversee the construction of the program, the Office of the Chief of Engineers (OCE) created an entirely new organization, headquartered in Huntsville, Alabama. Since the 1950s, Huntsville had been the center of the United States' first missile program, and locating the new division there enabled the Army to better coordinate with missile agencies in designing and building launch and radar facilities.[4] On 9 October 1967, the OCE formally organized the new agency as the U.S. Army Corps of Engineers, Huntsville Division. Huntsville was designed to function as an "operating division," in that it would execute mission assignments.[5] The USACE quickly appointed Colonel R.P. Young as the new commander and reallocated experienced engineers from the Mobile and Canaveral districts and the OCE to the new division. Initially located in an office building on Meridian Street in Huntsville, the organization moved after a year and a half to its new facility in Cummings Research Park, conveniently shared with the SENTINEL System Command.[6]

In 1968, Richard Nixon was elected president of the United States, and the new administration feared that SENTINEL's massive ABM defense network would threaten its national security vision of achieving a state of détente through arms control treaties with the Soviets. To maintain this strategic balance, the Nixon administration modified the nation's ABM defense network, renamed SAFEGUARD. Unlike SENTINEL's sweeping defense network, SAFEGUARD focused on protecting existing MINUTEMAN ICBM bases in the Midwest, major civilian populations, and deterrent forces. In August 1969, the U.S. Senate approved the Phase I deployment of the system and authorized construction on two sites at Malmstrom Air Force Base, Montana, and Grand Forks Air Force Base, North Dakota.[7] While construction commenced at both sites, only the North Dakota facility was completed.

In April 1970, construction began on the North Dakota SAFEGUARD facility, named the Stanley R. Mickelsen SAFEGUARD Complex (Figure 1.1). Huntsville Division, which had been established to oversee the construction of the SENTINEL system, took over the design and construction of the facilities needed for the deployment of the Army's SAFEGUARD Ballistic Missile Defense System. The SAFEGUARD system consisted of several primary components: the PAR, the MSR, SPARTAN missile launchers, co-located SPRINT missile launchers, and remote SPRINT missile launchers. In addition, Huntsville provided design and construction oversight for the system's support facilities. Completed in 1976, the system was deactivated after less than four months of operation, due to concerns over continuing an antimissile-missile arms race, cost, effectiveness, and a changing political climate.

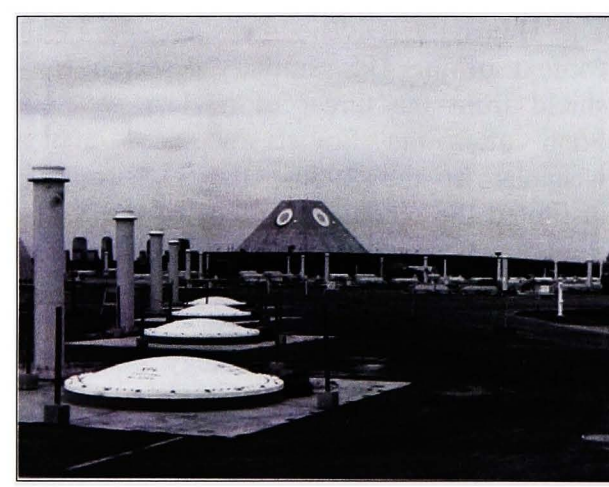

Figure 1.1 The Stanley R. Mickelson SAFEGUARD Missile Complex in North Dakota, the only operational ABM system deployed by the United States (courtesy Huntsville Center Public Affairs Office).

The Army used the Mickelson site as a test bed for ABM technology during the 1970s and 1980s.[8]

The Vietnam War monopolized most of the nation's foreign policy attention during the late 1960s and early 1970s, and the Nixon administration focused heavily on reaching a state of detente with both the Soviet Union and China. By the late 1960s, the United States and Soviet Union had reached a strategic parity in weapons. At that point, both sides became acutely aware of the need for a mutual agreement to control the arms race.[9] These attempts to reduce the hostilities between the East and West included the Strategic Arms Limitation Talks (SALT) I Treaty in 1972, which limited the number of ICBMs that either side possessed.[10]

After the signing of the ABM treaty on 26 May 1972, the Secretary of Defense directed a suspension of all SAFEGUARD construction at the Montana site. After the formal acceptance of the treaty, the Huntsville Division awarded two contracts for cleanup and restoration of the sites to as near natural condition as practicable. By July 1974, most of the foundations and buildings were removed or covered, and only the abandoned PAR remained.[11] While the SENTINEL or SAFEGUARD system never provided any real security for the United States, these two massive programs provided an engineering opportunity for the Division, and the lessons learned provided Huntsville with the ability to handle many similar and complex programs in the future.

With its SAFEGUARD assignment curtailed after the arms-control treaties of the 1970s and the Army-wide changes following the Vietnam War, Huntsville Division entered a period of uncertainty. In 1976, the Chief of Engineers initiated an intensive study regarding Huntsville's future within the Corps. On 4 November 1977, the Army released the "Study of the Mission, Functions, and Organization, U.S. Army Engineer Division, Huntsville," and soon assigned seven new missions to the organization. These included Corps Training Management, Design and Construction, Evaluation Program, Corps of Engineers Guide Specification Maintenance, Computer-Aided Engineering and Architectural Design Systems (CAEADS), Army Pollution Abatement Program (APAP), and Army Facilities Components System (AFCS). The purpose of the Corps' reorganization was to locate certain operating missions out of the OCE to a field-operating agency, which would allow the headquarters to focus on policy, guidance, and mission review. For Huntsville, this reorganization resulted in a diversification of mission assignments with the benefit of retaining its advanced technology expertise.[12]

During the mid-1970s, Huntsville Division transitioned from a design and construction organization, with a few missions dominated by the BMD program, to a diversified, high-technology engineering and design and procurement organization. As before, Huntsville remained an operating division without subordinate districts or geographical areas of responsibility, and it began to acquire missions that were worldwide in scope. The Division continued to be active in BMD, but also supported an increasing variety of programs.

Between 1977 and 1981, Huntsville's workload expanded from five missions to 26, albeit with only a small increase in personnel.[13] This increase was due in part to work acquired beyond the Corps of Engineers. The DOE recognized the Division's experience with advanced technology weapons systems and requested its engineering consulting support for the Pantex special weapons plant at Amarillo, Texas. Huntsville also assisted in development of systems

planning and engineering support for the Strategic Petroleum Reserve Program, participated on source evaluation boards for the synthetic fuels program, and continued support to the High British Thermal Unit (BTU) Pipeline Coal Gasification Program. By August 1980, Huntsville had assumed the role of contracting officer for two large coal gasification contracts, which included a wide spectrum of activities such as management, contracting, technical review, and plans and analysis.[14]

During the late 1970s, Huntsville provided design engineering and construction for test facilities at the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center in Huntsville and the National Space Technology Laboratory near Bay St. Louis, Mississippi. It provided similar support services for the Army Materiel Command's Munitions Production Base Support Program (MPBSP), as part of the Army's efforts to modernize obsolete Army ammunition plants from World War II. This stream of diversified projects also included the design and construction of facilities in the Sinai Desert for the multinational Peacekeeping Forces and Observers following the Camp David Accord. Huntsville Division also began supporting the MX missile construction program and was involved with design, training, systems engineering, management of selected programs, and site security systems. Because of the Division's experience with procuring items in support of the BMD program, USACE assigned Huntsville additional procurement missions for government-furnished property (GFP) and materials.[15] These procurement missions supported a variety of customers including the United States Postal Service and the Energy Research and Development Administration. The Division also provided support for the Saudi Arabian Procurement Program, a multibillion-dollar effort that provided GFP, equipment, and supplies for the Saudi government.[16]

Though wholly dissimilar, each mission assignment entailed characteristics that continue to define Huntsville's workload today: large-scale projects possessing no geographical boundaries but requiring specialized expertise. As a previous history noted, "these types of missions were uniquely suited for Huntsville Division, and the Division repeatedly proved its expertise in handling them."[17] By the early 1980s, Huntsville had evolved into a model organization within the USACE that maintained technical skill sets, and could function globally.

Huntsville had successfully transitioned from one mission assignment to many, and as a result, over the next decade its workload tripled. In 1982, the Corps officially revised the Division's official function to accommodate a broader range of programs, including those that required commonality or standardization, centralized management, "multiple site adaption," or "technology transfer."[18] By virtue of its diversified technical expertise, Huntsville was uniquely suited to establish what the USACE called Centers of Expertise (CX), a concept that included a "demonstrated, creditable, technical capability in a specialized subject area." By 1987, Huntsville was identified as the Corps' CX in more than a dozen specialty areas, including Energy Monitoring and Control Systems, Solid Fuel Conversion, Army Ranges, Army Facilities Component Systems, and Army Ammunition Plants. Huntsville also managed the CX for Intrusion Detection Systems, Electromagnetic Shielding, Mobilization Designs, Chemical Demilitarization Facilities, Child Development Facilities, and Third Party Contracting.[19]

As is the case today, Huntsville's missions constantly evolved, and when the Corps phased out one program, another took its place. The MPBSP continued to represent almost half of the Division's workload during the 1980s. Completion of the Mississippi Army Ammunition Plant (AAP) in 1984 at a cost of $493 million represented the Army's first new AAP constructed since World War II (Figure 1.2). That experience with design and blast-resistant technology combined with its previous management of the Army's Pollution Abatement Program in the late 1970s allowed Huntsville to cultivate a staff of environmental, chemical, and mechanical engineers. Because of this technical skill set, USACE assigned the Division additional ordnance-removal and remediation programs. Following the creation of the Defense Environmental Restoration Program (DERP) in 1985, Huntsville managed the required site investigation studies and also assumed responsibility for ordnance-disposal engineering on Formerly Used Defense Sites (FUDS).[20]

Huntsville began research and development support for another environmental program in 1982 when it agreed to assist the U.S. Army Toxic and Hazardous Materials Agency (USATHMA) with the research and development support for chemical weapons disposal programs. The Division also provided contract assistance for the Chemical Agent Disposal System (CAMDS), a pilot facility designed to safely destroy obsolete, unstable, or excess chemical munitions as directed by the Army. Huntsville's responsibilities for these programs included continued management of the chemical demilitarization operations at Tooele Army Depot (Utah) in 1982 and new designs for facilities at Johnston Atoll in the Pacific, Umatilla Army Depot in Oregon, Blue Grass Army Depot in Kentucky, and Anniston Army Depot in Alabama.[21] In 1990, Huntsville was designated the Life Cycle Project Manager (LCPM)[22] for the Chemical Stockpile Disposal Program (CSDP) and provided construction oversight for facilities at Anniston and Umatilla.

Figure 1.2 The Mississippi Army Ammunition Plant was situated on property leased from NASA's Stennis Space Center (NASA photo).

While the MPBSP and Chemical Demilitarization programs dominated the workload during the 1980s, the Division continued to support procurement and contracting activities. In 1983, Huntsville contracted with USACE European Division to secure items necessary for the Weapons Access Delay Program. During this time, it continued support of GFP programs. Huntsville used its contracting capabilities to acquire high-technology equipment such as Magnetic Resonance Imaging systems and Computed Tomography (CT) Beam Scanners for the Office of Surgeon General. Through a Memorandum of Understanding with the U.S. Army Reserve (USAR) in 1987, the Division began its program of providing furnishings for the USAR, and was eventually designated the responsible agency for barracks furniture installation.[23]

As the Cold War ended, the Department of Defense (DOD) dramatically curtailed its military expenditures through both the reorganization of commands and

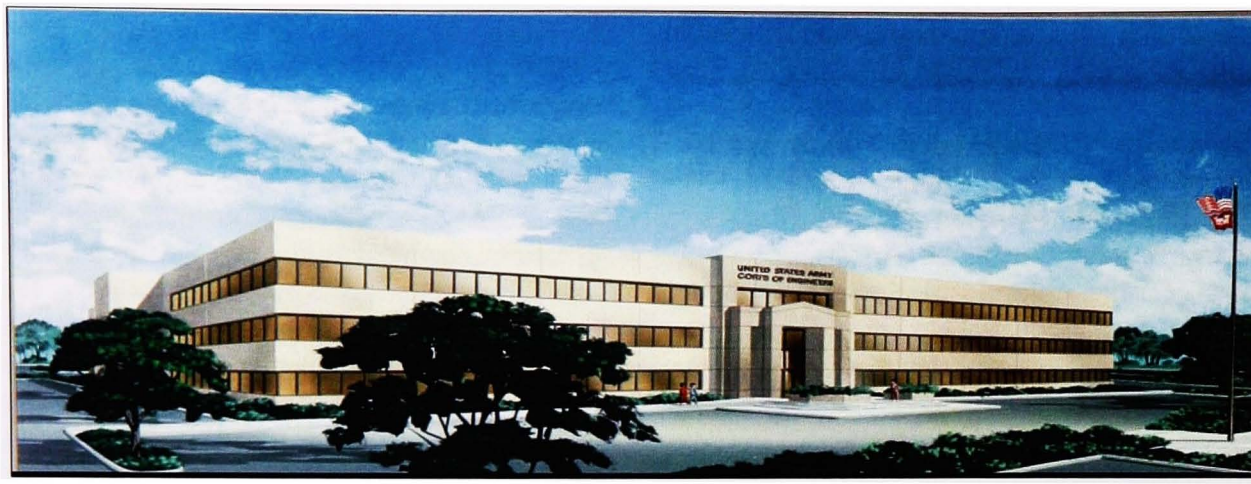

Figure 1.3 The U.S. Army Engineering and Support Center headquarters building on University Square in Huntsville, Alabama.

implementation of Base Realignment and Closure (BRAC) commission recommendations. Military construction districts witnessed shrinking budgets, yet Huntsville's workload increased as a response to the desire for more efficient work. With personnel and funding reductions, installations and districts found program management difficult at best.[24] Moreover, many did not have the technical expertise for activities for projects involving ordnance removal, range renovation, or facility modernization.[25] Therefore, by virtue of funding limitations and its own unique capabilities, Huntsville was best suited to provide centralized management of such programs.

Operations Desert Shield and Desert Storm (1990–1991) represented the U.S. military's first large-scale armed conflict since the Vietnam War and tested many of the Corps' new programs. Notably, Huntsville Division supported the Kuwait Emergency Recovery Office (KERO) by administering approximately $200 million of firm fixed-price contracts. Additionally, the Division maintained the Army Facilities Components System (AFCS) database, which included data for thousands of standardized facilities designed for any theater of operation.[26]

DOD budget cuts during the 1990s forced the Corps to drastically reduce its workforce and reorganize with four fewer division offices. Much like the situation of the 1970s, Huntsville's immediate future remained uncertain.[27] In 1995, the Corps redesignated Huntsville Division, calling it the "U.S. Army Engineering and Support Center." That same year, Huntsville Center moved into its new office on University Square (Figure 1.3). The organizational changes maintained the Center's identity as a highly skilled organization unfettered by geographical boundaries, but also offered new obstacles. The changes did not result in overall personnel reduction; however, the Center did lose both its General Officer and Senior Executive Service (SES) positions.

The Center receives no labor funding from Congress and is reimbursed for its work through funding from its customers. As a fully reimbursable organization, the Center had endeavored since the late 1980s to improve both efficiency and cost-consciousness. Early involvement with the Army Communities of Excellence (ACOE) program proved a successful path to building an *esprit de corps* and "encouraging professionalism and progressive thinking among employees." The

implementation of Total Quality Management (TQM) in 1993 provided the means to measure customer satisfaction and the efficiency of business practices. Experience with ACOE and TQM enabled the Center to effectively transition into the Army Performance Improvement Criteria (APIC) program in 1995. The APIC program focused on measured performance and provided the means to objectively evaluate the organization's activities. Colonel John Cunningham (Ret.) noted, "The organization that accurately measures cost, quality, timeliness, and customer satisfaction has a significant advantage. The successful governmental organizations of the future will be the ones that demonstrate their effectiveness with solid objective information."[28]

Early APIC evaluations revealed customer concern with high costs. As a result, the Center established formal teams at the directorate level and developed product lines defined by "specific visions, goals, missions, and strategies." By 1997, the Center had reduced overhead and expenses, improved customer satisfaction, and provided high-quality services at a lower cost than Corps military districts or private engineering firms.[29] As one subsequent commander noted, at Huntsville "you don't have captives, you have customers. So you can't afford to be wrong in your organizational construct or not deliver a capability."[30]

Established with a single mission and no geographical boundaries or civil works responsibilities, Huntsville began as a unique organization. Through its technical expertise and global scope, it successfully transitioned from one mission to many and continued to acquire programs despite defense expenditure reductions and Corps reorganization. By the late 1990s, Huntsville's centralized and efficient management of complex and diversified programs had created a fortuitous framework for the challenges that emerged in the next millennium.

CHAPTER 2 ▪ *THE HUNTSVILLE CENTER MATURES: Competitiveness, Perceptions, and Challenges*

During this historical period, 1998–2007, many of the organizational challenges and changes experienced by the Huntsville Center resulted from the simple fact that the Center represents a unique entity within the Corps of Engineers. The Center receives no direct labor funding from Congress, nor does it fall under the command of a single Corps division or district. Like the Transatlantic Programs Center (TAC) headquartered in Winchester, Virginia, and the Engineering Research and Development Center (ERDC) located in Vicksburg, Mississippi, the Huntsville Center reports directly to Headquarters, U.S. Army Corps of Engineers (HQUSACE) and operates as a cost-reimbursable organization supporting a broad customer base.[1] According to former Resource Manager Donna Rovere, "You have to run [the Center] like a business or any other Fortune 500 company, but it's harder to run than a business because you can't make a profit."[2]

Figure 2.1 The U.S. Army Engineering and Support Center, Huntsville, logo.

The Huntsville Center provides centralized management for a variety of engineering programs and projects. Its chartered mission includes programs that:

- Are national
- Are broad in scope or technically complex
- Require integrated facilities or systems crossing geographical division boundaries
- Require commonality, standardization, multiple site adaptations, or technology transfer
- Require a centralized management structure for program development, coordination, and execution
- Require services not provided by other Corps organizations

Given its responsibility for such a broad range of programs, the Center's organization and business practices are integral to providing cost-effective program management for its customer base. Early efforts to improve the Center's competitiveness included participation in ACOE, a voluntary program directed by the Army Chief of Staff. The ACOE program, adopted by the Huntsville Center in 1989, emphasized improvements to facilities, personnel interaction, and efficiency. In 1993, the Center adopted TQM, a business strategy that focused on customer satisfaction, performance metrics, and employee empowerment.[3]

While ACOE and TQM provided guidelines for business improvement, the Center's implementation of the Army Performance Improvement Criteria (APIC) in 1995 offered a new business model, with an established set

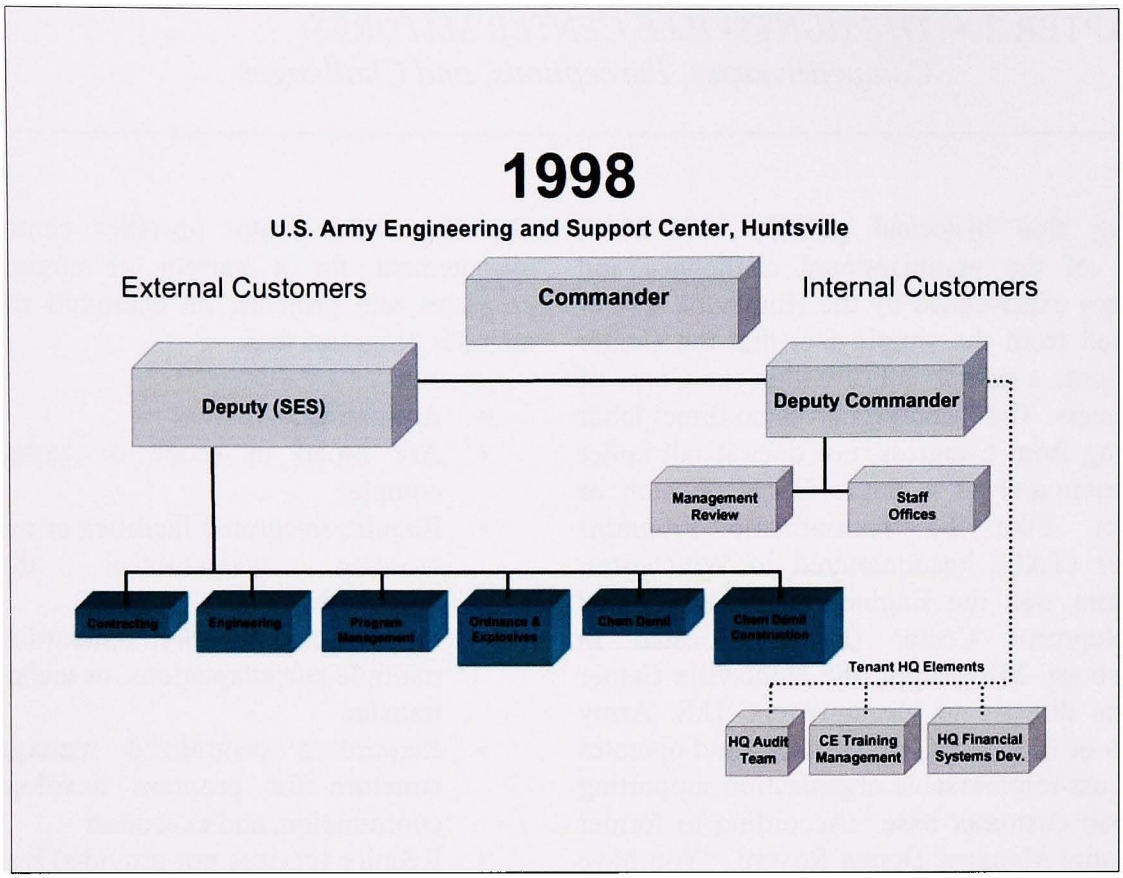

Figure 2.2 Huntsville Center Organizational Chart, 1998.

of metrics, evaluative criteria, and "solid objective information." Based on the Malcolm Baldrige criteria to evaluate business success and customer satisfaction, the categories measured by APIC included leadership, information and analysis, strategic planning, human resource development and management, process management, business results, and customer focus and satisfaction. Under the leadership of Colonel John Cunningham (Ret.), who commanded the Center from 1995 to 1999, the Center established formal teams at the directorate level, divided programs into "product lines," and improved overall customer satisfaction.[4]

The Huntsville Center reorganized in 1995 to place directorates based on external customer product lines under a civilian Deputy for Programs and Technical Management, then Mr. Charlie Hess. Internal customer directorates and staff offices focused on internal customers were under the supervision of the military deputy commander at the time, Lieutenant Colonel Bob Hatton. Designed to "reinforce customer focus," this "flatter" team structure reduced hierarchical barriers so that "project managers, contracting officers, and resident engineers [were] less hindered by bureaucratic boundaries."[5]

The organizational structure established by Colonel Cunningham changed little between 1998 and 2007, though the organization evolved to accommodate new directorates as the Center acquired additional work from existing product lines (Figures 2.2 and 2.3). For example, the Mandatory Center of Expertise for Medical Facilities (MCX-MX)[6] was transferred from HQUSACE to the Center

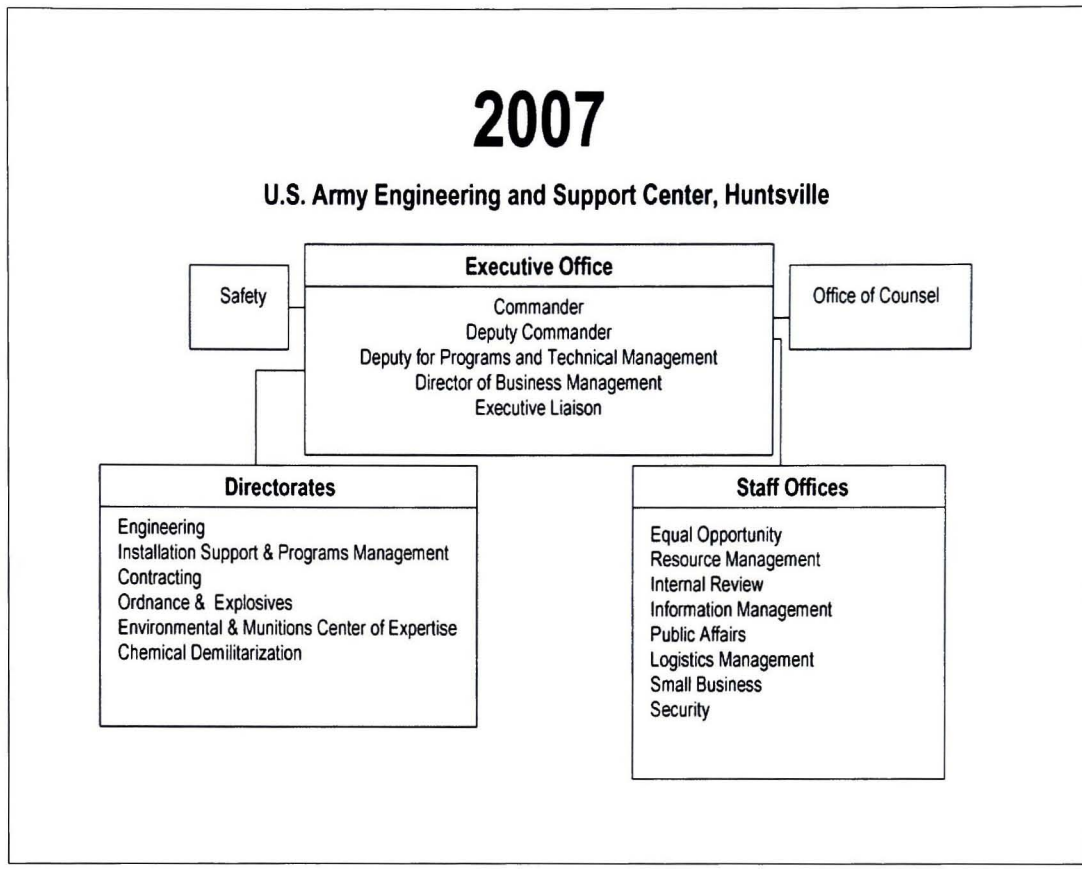

Figure 2.3 Huntsville Center Organizational Chart, 2007.

in 1999. Also, by 2000, the Chemical Demilitarization and Chemical Demilitarization Construction directorates combined into one unit, with Installation Support and Ballistic Missile Defense standing up as separate directorates. In 2005, the Center reorganized to include a Business Management Office reporting directly to the commander. The plan also split Installation Support Management into two directorates (Project Management and Installation Support Programs).[7]

In 2006, after listening to employee concerns regarding the organization's structure and its ability to meet future demands, Colonel Larry D. McCallister initiated a study. The study evaluated anticipated business growth attributed to Military Construction Transformation, support for the DOD's military health care system (TRICARE), additional ordnance and explosives remediation work, and the transfer of the Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Expertise mission to Huntsville. The study also considered an initial survey of 50 employees, HQUSACE directives, financial performance, customer support, and command guidance. "I wanted us to be a more efficient organization," said McCallister, "and make sure we were supporting our customers." The most substantial change included the combination of the Project Management and Installation Support directorates, established under the reorganization of 2005, which created the Installation Support and Programs Management Directorate. The new directorate also absorbed Ballistic Missile Defense as a division. At that time, HQUSACE officially

designated the Huntsville Center as the CX for Installation Support. Most other changes took place at the division level, including the realignment of the Safety Office from the Engineering Directorate to reporting directly to the Commander. The reorganization implemented by McCallister was completed in November 2007 when the HTRW-CX, based in Omaha, Nebraska, merged with Huntsville's Military Munitions Center of Expertise (MM-CX). The consolidated Environmental and Munitions Center of Expertise reported to Mr. John Matthews, the Center's Deputy for Programs and Technical Management.[8]

Competition and Customers

By using the Baldrige criteria, "Huntsville Center transformed itself from one of the Corps' most expensive elements to one of its most efficient," and competed equally with private-sector architecture and engineering firms. Between 1995 and 2000, the new streamlined organization produced measurable results, particularly those related to operating costs. Furthermore, at a time of decreasing military expenditures, during the late 1990s, the Huntsville Center's workload increased by 94 percent.[9] The Huntsville Center's new quality business practices were immediately apparent and resulted in a number of governmental awards.

In 2000, the Office of the Secretary of Defense, Quality Management Office, ordered an independent audit to examine the process improvement results of Department of the Army Quality Management teams. The audits, performed by Anna D. Gowans Miller in Washington, D.C., were designed to "verify, validate, and ultimately certify the related gains or losses." The Gowans Miller audit of the Huntsville Center verified the organization's in-house cost savings, totaling more than $107 million, and noted, "The savings... represent a conservative estimate for the cost avoidance and productivity savings generated." Additionally, as the audit documented:

> Since implementing the team structure and other process improvements in 1995, Huntsville Center has received a plethora of awards and other recognition of its excellence. It received the Best Small Army Audit Office Award in 1997, 1998, and 1999, Hammer Awards for Energy O & M in 1997 and 1998, and the USACE Architect of the Year Award in 1997. In 1998, it was an ACOE Chief of Staff Winner, and also won the DOD Certificate of Recognition for Acquisition Innovation and the President's Quality Award Achievement Award. In 1999, it received the Alabama Quality Award for Service Sector and the President's Quality Award Merit Award, the DOD Productivity Excellence Award, the Under Secretary of Defense Financial Management Award, and the USACE Engineer of the Year Award. In 2001, it received the President's Quality Improvement Award, ranking it among the top three federal organizations.[10]

To provide the most cost-effective products, the Center targeted the reduction of overhead and in-house expenditures, or how much of the customer's money was used to execute projects. However, as Quality Manager Betty Neff questioned, how do reimbursable governmental organizations determine "competitive performance, efficiency, and 'bottom line' measures in the absence of profit?" The Huntsville Center developed a "scorecard" that evaluated competitiveness based on customer savings as opposed to profit. The scorecard revealed that between

1992 and 1995 the Center used 11.3 percent of total expenditures, and had reduced that number to 8.1 percent during the next four-year evaluation period, 1996–1999. By FY01, that number dropped to 7 percent. According to Neff, "We were able to attribute the change to improved efficiency," including the "ability to execute more work with fewer resources on specific projects." In addition, the scorecard indicated a 33 percent reduction in general and administrative (G&A) overhead costs between 1995 and 1999 alone. By FY01, overhead costs fell to 21 percent, or a 50 percent reduction from the baseline established in 1995. The Gowans Miller independent audit also verified these results, noting, "The Center has put the funds appropriated to its customers and provided to it for goods and services to excellent use." Through the end of 2007, G&A costs had fluctuated slightly, but had risen to approximately 24 percent.[11]

Through the application of APIC principles, the Center also placed a renewed emphasis on customer satisfaction. The first step included defining the customers, suppliers, and competitors. For example, the Center conducted ordnance and explosives remediation projects for the Department of the Army (customer), in partnership with a Corps district (supplier), with the Army Environmental Center as its chief competitor for the work. "In the type of organization that Huntsville Center is," said Colonel Harry Spear (Ret.), "you don't have captives, you've got customers." As a reimbursable organization, the Center continued to compete for work with other organizations that carried similar technical capabilities.[12]

Early APIC evaluations indicated customer dissatisfaction with the Center's cost efficiency, and "shrinking federal budgets demand[ed] low costs." The Center measured external customer satisfaction through a series of questions designed to evaluate three key components: cost, responsiveness, and quality. Answers were calculated on a scale of 1 (lowest) to 5 (highest). For example, the questions posed to external customers in 2007 included:[13]

Do the Huntsville Center and the Project Team led by [team]:

1. Seek your requirements, priorities, and expectations and incorporate them into our service?
2. Manage your projects effectively?
3. Treat you as an important member of the team?
4. Solicit, listen to, and resolve your concerns?
5. Provide timely services?
6. Deliver quality products and services?
7. Deliver products and services at reasonable costs?
8. Display flexibility in responding to your needs?
9. Keep you informed?

Through analysis of the responses to these questions, the Center identified deficiencies related to cost or responsiveness and initiated corrective actions for products, services, and communication. Improvements included specific action plans, such as a customer service packet with information on a product line, or the development of a customer satisfaction index (CSI) validated through an additional set of questions.

During the first four years of APIC evaluation (1995–1998), the Center's customer satisfaction ratings rose from 3.75 to 4.15, or approximately 10 percent. By 1999, the Center's rates exceeded those of other Corps organizations. To improve response rates from external customers, the Center sent its first Web-based surveys through e-mails in 2001. While the Center stopped using APIC as a self-assessment tool in 2002, it continued to

Figure 2.4 Huntsville Center Quality Management Policy.

focus on and evaluate its customer relationships. Between 1995 and 2007, customer satisfaction rose by approximately 20 percent and, by 2007, more than 88 percent of the Center's customers expressed high or highest satisfaction.[14]

Following the implementation of the Army Performance Improvement Criteria, the Huntsville Center refocused and developed methods to refine quality management. While the Center established measurable cost savings and streamlined its business practices through APIC, "We were struggling with being a quality driven organization," said Colonel John Rivenburgh (Ret.), Huntsville Center commander from 2003 to 2006. "Our project management effort was not as effective as we would have liked. How do you execute your process from one [project] to another?" In August 2003, the Center's senior leadership voted to seek ISO 9000 compliance to develop consistent quality management. Established by the International Organization for Standards in Europe, ISO 9000 emphasized documentation and control of business processes and standards. Initially designed for the manufacturing sector, the service industry easily adapted to ISO 9000 as well, in that it provided a framework for consistency, eliminated redundancies, and developed baseline documentation for future evaluation. ISO 9000 represented a "starting point" for evaluating system improvements.[15]

Dr. Mike Stovall, then Deputy for Programs and Technical Management, noted that because of the complexity and "many moving parts" of the Center's workload, ISO 9000 was a "great fit." The quality management program (Figure 2.4) also allowed for the development of a "predictable product," in terms of quality, cost, and schedule. Until ISO 9000, "[the Center] never had a [standard documented]

process for finishing" a project or fully documenting the customer's dollars through from beginning to end. The Center developed a series of formalized Quality Procedures (QPs) and Work Instructions (WIs) that established guidelines for everything from document control, customer communication, management review, travel, security, and work environment. From 2004 to 2005, the Center conducted internal training sessions to develop employees as ISO experts and educate the workforce regarding the QPs and WIs. Once the Center implemented the formalized policies, it conducted internal audits and monitoring to ensure that the process worked, and, if necessary, steps were taken to develop corrective actions. "We worked really hard on scope, schedule, and budget to put the project management process into effect," said Rivenburgh. "[We wanted] to drive project managers to really understand those three things, and know when they were in trouble and when to ask for help."[16]

In addition to improving quality management, the Center sought to refine productivity through the integration of Lean and Six Sigma. Lean processes focus on eliminating waste (overproduction, unnecessary wait times, defects) to improve efficiency. Six Sigma improves quality by statistical analysis. The Army formally adopted Lean–Six Sigma in 2006, but many of its support organizations, including the Huntsville Center, had already implemented some of the principles. In 2004, the Center's Contracting Directorate began training employees in process improvements. Pilot projects included the reduction of late payments and invoices, improvement on acquisition pre-award process, and reduction of lag time in closing out contracts. At the end of 2007, the Center established a training program for employees to become "green-belt" certified in Six Sigma. Importantly, Lean–Six Sigma dovetailed with the Center's ISO 9000 efforts.[17]

The Huntsville Center's quality management system achieved ISO certification on 31 March 2007 (Figure 2.5). "Since not every organization gets ISO certified," Neff said, "it tells our customers that we are dedicated to delivering products and services that meet their requirements. That after all, is the definition of quality."[18]

Figure 2.5 ISO Certification Ceremony, 2007 (pictured: MAJ GEN Ronald L. Johnson and COL Larry D. McCallister).

Shedding False Perceptions

Among Corps organizations, the Huntsville Center remains unique. Specifically, the national charter allows customers, such as garrison commanders or installation Directors of Public Works (DPWs), to contract work directly through the Center as opposed to a geographical Corps division or district. During the 1990s, in a period of decreased military expenditures, other Corps organizations were often concerned for the sustainability of their own programs because of the Center's ability to provide cost-competitive products nationwide. "People were fighting for the same dollars," explained Charles Ford of the

Center's Installation Support and Programs Management Directorate.[19]

Huntsville Center personnel viewed their work differently, and not in terms of contracting a quantitative number of projects, but in executing programs and providing the best cost value to their customers. The national charter grants the Center a "hunting license," according to former Director of Installation Management Mirko Rakigjija. "It doesn't mean they can hunt or shoot straight, but if they shoot straight they get to shoot again." "We bring a second bull into the pasture," said Facility Support Division Chief Stan Lee. According to Ford, "If we support the customer better than other people, then why not do it?"[20]

To alleviate many of the false perceptions, the Center's commanders and senior leadership emphasized building relationships with installations and Corps districts. According to Rivenburgh, "You are at times crossing turf lines where there is turf involved. The best way to avert it is go in early—you could call it a pre-emptive strike." Along with the commanders of the Transatlantic Programs Center and the Engineering Research and Development Center, Colonel McCallister began briefing new Corps district commanders in 2006. The briefings, presented at required Corps pre-command courses, offered the opportunity to communicate the Center's mission, program management, and how the Center could assist with a district's project execution. Upon invitation, McCallister also briefed district commanders at quarterly division-level business meetings. "There are still pockets of resistance," said McCallister, "but most of the districts now have more work than they can handle. Because of BRAC, Grow the Army and Military Transformation, the districts have their plates full and are trying to hand off work to us."[21]

The Center's workload grew during the late 1990s, through the acquisition of new large-scale programs. The Center also received recognition for new Centers of Expertise by HQUSACE. For instance, during the late 1990s, the government transferred management of the Russian chemical demilitarization facilities to the Huntsville Center. In 1998, the USACE Chief of Engineers closed the Center for Public Works, transferring installation support activities to the Huntsville Center. In 1999, the Center received operational mission responsibilities for the Medical Facilities Office in Washington, D.C. In 1998, the Center maintained four Mandatory Centers of Expertise (MCX) and three Technical Centers of Expertise (CX). In 2007, that number had grown to five MCXs and six CXs. As Brenda Hatley noted, "In the last ten years, we have gone out of our way to truly exhibit the 'One Doors to the Corps' mentality." Importantly, much of the Center's growth over the past 10 years can also be attributed to the ability of its

In Their Own Words:

Boyce Ross, Director of the Huntsville Center's Engineering Directorate

The engineering staff here now supports a much more diverse workload than we have ever had to support. It could be anything from renovating a medical facility, to basic repair and renewal, to disaster relief, or helping out agencies like NASA rebuild the Stennis Space Center. The Corps of Engineers being a premiere engineering organization and the Huntsville Center is not a one trick pony anymore where we are just experts in missile field design, or chemical and ammunition plant design. We have a very diverse group of engineers and scientists now (interview with Boyce Ross, 2008).

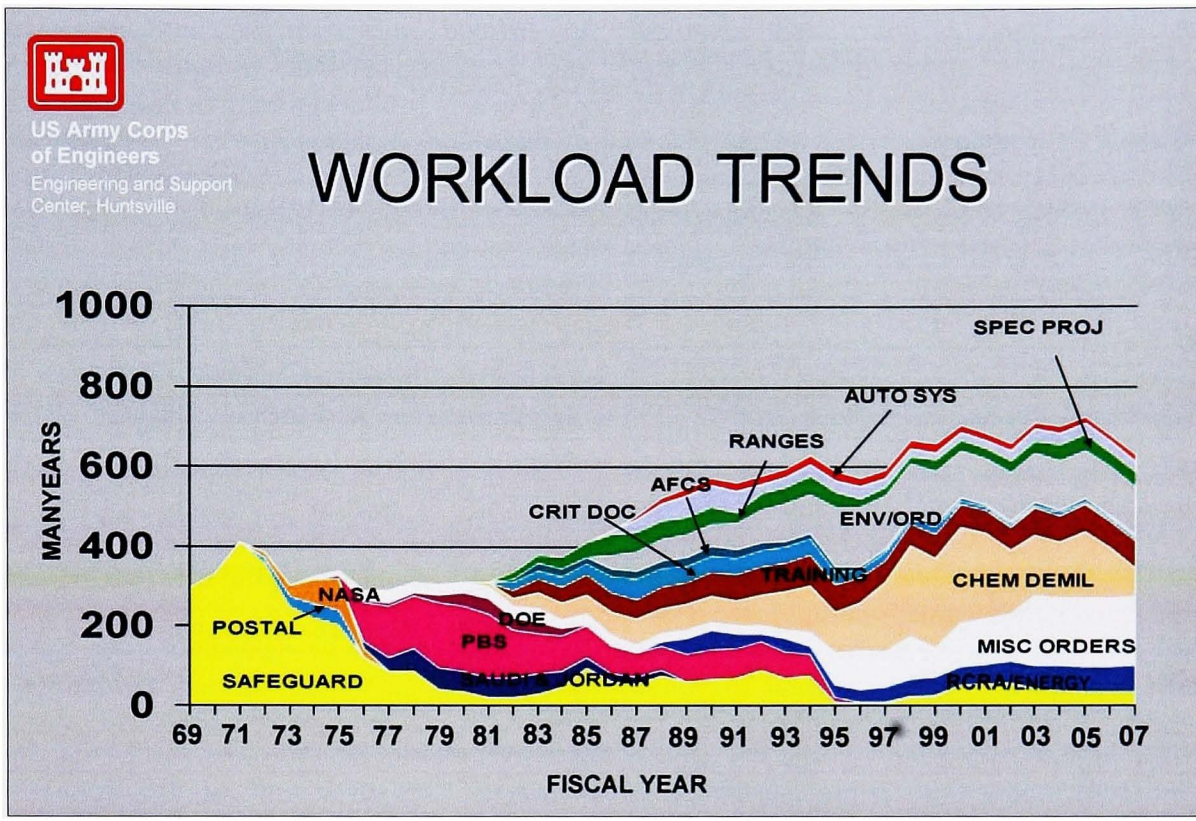

Figure 2.6 Huntsville Center workload trends, 1969–2007.

employees to develop new product lines under its nationwide charter and within its designated areas of expertise. In fact, the Center's leadership encourages management-level personnel to take such initiatives. "It's a bottom driven thing," said Ford. "We have to keep looking to the future."[22]

The Center's workload has grown in size and diversity and has adapted to survive the completion of product lines while absorbing others (Figure 2.6). For instance, in FY98 the Chemical Demilitarization program accounted for approximately $225 million in planned obligations, or 43.8 percent of the Center's total anticipated workload. Ordnance and Explosives work represented $48 million, or 9.3 percent of the workload at that time. For FY07, Chemical Demilitarization work decreased to 18 percent, or approximately $166 million, with Ordnance and Explosives expenditures increasing to 27 percent, or $244.9 million. This fluctuation was largely attributable to the completion of long-term chemical demilitarization projects and the acquisition of ordnance and explosives work through the Captured Enemy Ammunition and Coalition Munitions Clearance programs.[23]

During this period, the Center's growth and diversification can also be attributed to the expansion of installation support activities. Additional funding through BRAC implementation, Army and MILCON Transformation, Grow the Army initiatives, and the GWOT enabled the Center to build on a small cadre of existing programs to develop numerous installation support services product lines. Such growth, according to Stan Lee, is "a testament to our ability to find where the need is, and to fill that niche."[24] For example, following the terrorist attacks of 11 September

U.S. Army Engineering and Support Center, Huntsville Centers of Expertise, 1998/2007	
1998	**2007**
Army Range and Training Lands Program (RTLP) *	Army Range and Training Lands Program (RTLP) *
Ordnance and Explosives *	Electronic Security Systems (ESS) *
Utility Monitoring & Control Systems (UMCS) *	Medical Facilities *
Intrusion Detection Systems *	Environmental and Munitions *
Demand Side Management	Utility Monitoring & Control Systems (UMCS) *
Operations & Maintenance Engineering Enhancements (OMEE)	Energy Savings & Performance Contracting (ESPC)
Energy Savings & Performance Contracting (ESPC)	Heating, Ventilation and Air Conditioning (HVAC)
	DD Forms 1391 / 3086
	Operations & Maintenance Engineering Enhancements (OMEE)
	Facility Systems Safety *
	Installation Support *
	Facility Planning & Military Construction Programming
	Facility Reduction
	Access Control Points
	Barracks/Office/Medical Furniture
	Energy
	Facilities/Medical Repair & Renewal
* Mandatory Center of Expertise	

2001 (9/11), the DOD initiated additional security measures for installations. The Huntsville Center, already the Army's MCX for Intrusion Detection Systems, acquired an additional workload for access control points and electronic security systems.

The Human Element

While the size and diversity of the Center's programs grew during this period, staffing levels remained relatively constant. For instance, the Center's personnel increased from 502 in 1998 to 550 in 2007. During the same time, expenditures rose from approximately $500 million to $1 billion.[25] During the period of APIC evaluation, the Center measured workload versus staffing levels, or business efficiency, in what were called "stress charts." "The consequence of hiring more people and [adding to] the payroll is that you have to pass that cost on to the customer," said Colonel Harry Spear (Ret.). "You can't make any more time, but you can use your time efficiently."[26]

An aging workforce and competitive local business environment, however, continued to challenge the Huntsville Center's ability to recruit and maintain its technically diverse workforce. Since the 1990s, the Corps of Engineers' priorities have evolved to include addressing terrorism, natural-disaster response, homeland security, and other contingency operations. With a largely civilian workforce, the Corps struggled with, and continues to confront, competition from the private sector, the loss of personnel to contingency

operations, and an increasing number of employees eligible for retirement.[27] The Huntsville Center faced the added challenge of competing with other government organizations located in the region for highly qualified or experienced engineers. Agencies such as NASA have a higher employee grade structure and also provide attractive work and competitive pay scales for new college graduates. "The workload demand in this area is tremendous, especially contracting and engineering," Colonel McCallister said. "We hire two and lose three." Under McCallister's leadership, the Center worked to streamline and shorten its hiring process, in addition to using retired or rehired annuitants.[28]

While the Huntsville Center began as an organization based heavily on engineering design, it evolved over four decades to become one of the government's premier contracting agencies. While the Center's workload continued to grow and diversify during this historical period, it retained a limited amount of in-house design work. "The problem [that] creates, by passing the work through to a contractor," said Engineering Director Boyce Ross, "it's hard for us to maintain technical competency. So, strategically we are having to look at what work to keep in-house in order to maintain that technical competency. And that's a constant challenge."[29]

In Their Own Words:

Brenda Hatley, Ordnance and Explosives Directorate

The Center has always expanded and contracted within itself to keep an almost static level. If you look at staffing levels over the years, there are not a lot of peaks. It's pretty constant. So, that's always been very impressive to me (interview with Brenda Hatley, 2008).

In addition to retaining technical skill sets, the Center recognized the difficulty of recruiting and maintaining engineers to provide product design review. According to former Engineering Director Ron Lein, "You've got to have challenging work for them."[30] Some of the in-house design work completed by the Center included ranges for the Marine Corps, child development centers for the Army's Center of Standardization initiative in 2006, and facilities for the Chemical Demilitarization Directorate.

The Center lost its Senior Executive Service (SES) position when Dwight Burns left the Center in January 2000. "We felt that really put us at a disadvantage when it came to having a voice in the Corps family and at Corps headquarters," said Jim Cox, former Chief of the Business Management Office. The SES position, the civilian equivalent to that of a General Officer, provided longevity of leadership that spanned changes in command and enabled the Center to communicate directly with customers of the general-office level. "We might have lost the bubble on a couple of things because we didn't have that continuity," said Colonel John Rivenburgh (Ret.), "but we established some pretty good relationships with the Alabama Congressional Delegation, and visited them every year in Washington."[31]

Moreover, in 2002, HQUSACE restricted the Command Management Reviews (CMRs) to general officers, leaving the Huntsville Center without representation. Held quarterly, the CMRs compared the business practices and products of Corps officers. During Colonel Cunningham's tenure, the CMRs offered the Center an opportunity to exhibit its competitive costs as well as compare its

efficiency to Corps divisions and districts, particularly those with similar programs.[32]

During this period of unprecedented growth, the Center benefited from the leadership of its four commanders. As noted above, the Center's new business model developed through the APIC self-evaluation tools provided a strong basis for much of the increased workload.[33] Colonel John Cunningham (Ret.), commanding the Huntsville Center from 1995 to 1999, "brought a tremendous amount of change to the organization," and turned the Center into the Corps' most cost-effective and efficient organization. Colonel Harry Spear (Ret.) arrived at the Huntsville Center from the Louisville District in August 1999. From a business perspective, Spear built on Cunningham's success and refocused efforts on the management processes and holding managers accountable for delivering products at cost. "If the organization understands people, time and money, they'll be successful. They were successful before I got here and they were a lot more successful after I left. That's a good testimony for good people."[34]

"When I got here [in 2002]," said Colonel John Rivenburgh (Ret.), "the Center was rocking and rolling." As the U.S. military continued to execute the GWOT, Rivenburgh focused on new quality management initiatives, including ISO certification and the implementation of Lean and Six Sigma processes. Upon his arrival in 2006, Colonel Larry McCallister described himself as a "pro-active" commander, immediately evident when he initiated a reorganization study for the Center. "There were things that each commander did that made a difference," said Rivenburgh, "but the day-to-day differences were all made by great Americans."[35]

Figure 2.7 Colonel Walter J. Cunningham.

Figure 2.8 Colonel Harry L. Spear.

Figure 2.9 Colonel John D. Rivenburgh.

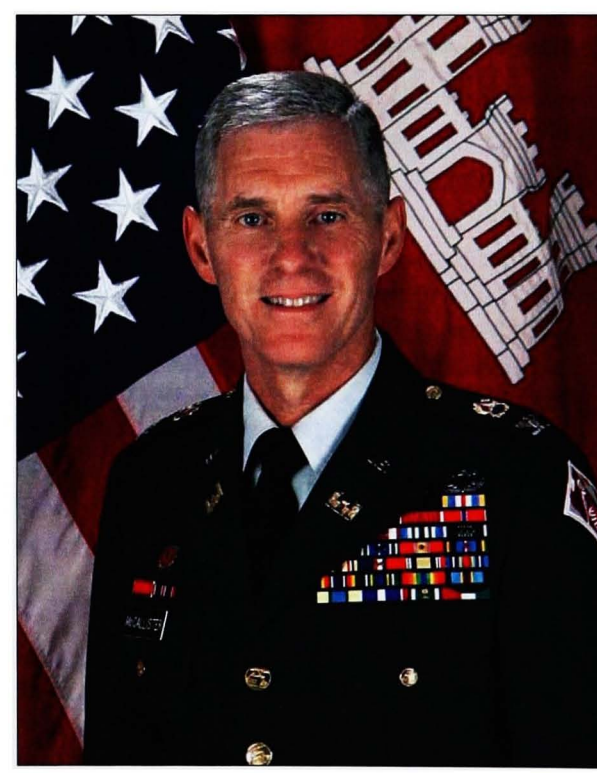

Figure 2.10 Colonel Larry D. McCallister.

CHAPTER 3 ▪ *THE HUNTSVILLE CENTER and the CHEMICAL DEMILITARIZATION MISSION*

The disposal of the United States' stockpile of chemical weapons has been one of the most technically and politically complex programs undertaken by the U.S. Army since World War II, in addition to being one of the most expensive. From 1998 to 2007, the Huntsville Center remained active in supporting the design and construction of chemical weapons demilitarization facilities in the United States, Pacific Territories, and former Soviet Union and completed many of the projects it began in the early 1990s.[1] In the United States, the Center's Chemical Demilitarization program functioned as the USACE Life Cycle Project Manager for facility design and construction, equipment design, acquisition of installed equipment, and building complex facilities at continental U.S. (CONUS) facilities. As required by the DOD and U.S. Congress, the program experimented with various new technologies, including incineration, to safely destroy the nation's stockpile of aging chemical weapons.

The Center's Chemical Demilitarization mission also continued to include the design and construction of eight chemical disposal facilities in the United States. These facilities were located at eight U.S. Army bases, including Aberdeen Proving Ground, Maryland; Anniston Army Depot, Alabama; Newport Chemical Depot, Indiana; Pine Bluff Arsenal, Arkansas; Umatilla Army Depot, Oregon; Tooele Army Depot, Utah; Blue Grass Army Depot, Kentucky; and Pueblo Army Depot, Colorado. In addition, the Center provided design and construction oversight for the facility at Johnston Atoll in the Pacific. The Center also provided program management for the Cooperative Threat Reduction Program's Russian Weapons Destruction program, which included construction by Russian contractors of the weapons disposal facility in Shchuch'ye, Russia. American military and political leaders saw the destruction of chemical stockpiles as a means to eliminate the potential for accidents and terrorism, and further protect the public and the environment. Finally, the Huntsville Center continued to aide with the design and preparation for construction of the Defense Threat Reduction Agency's Central Reference Laboratory in Baku, Azerbaijan.

Since the early 1980s, the Center has been involved in several demilitarization programs, including the Chemical Stockpile Disposal Program (CSDP), as well as alternative demilitarization technologies, Russian chemical demilitarization, and the destruction of large rocket motors. However, its largest responsibility was support of the CSDP. In 1990, HQUSACE appointed Huntsville Division as the Life Cycle Project Manager for chemical demilitarization. In 1992, the Division also received the chemical demilitarization construction mission. After 1998, the Huntsville Center continued to spend a large portion of its funds to support CSDP. In fact, in 1998, the Chemical Demilitarization program accounted for approximately $225 million dollars or 44 percent of the Center's obligated budget. Over the next 10 years, however, construction was completed on many of the facilities and the plants moved into the chemical weapons systemization and operations (demilitarization) phases. By FY08, the Chemical Demilitarization program accounted for 16 percent of the Center's obligated budget, with FY09 funds expected to be approximately 8 percent.[2]

Overview of the Chemical Stockpile Disposal Mission

As with many other military projects, the U.S. Army developed its Chemical Demilitarization program over a long period and based it on changing needs.[3] The Chemical Demilitarization program began in the 1960s as a response to an aging stockpile of unused and increasingly unstable weapons and stockpiled agents. Demilitarization remained important during the post–Cold War period, as the United States assisted in the removal of chemical weapons from its arsenal and that of the former Soviet Union. After the events of 9/11 occurred, the nation turned its attention to threats from fundamentalist Islamic terrorism and "rogue nations." Because of the primary threats to American national security, the destruction of weapons of mass destruction and chemical weapons gained more prominence.[4] From 1998 to 2007, the Huntsville Center established field construction oversight offices at six stockpile locations in the United States, one at Johnston Atoll in the Pacific, and one in Russia to oversee construction. The Corps workforce peaked at more than 150 personnel as construction was completed at the sites.

World War I introduced the use of chemical weapons on the modern battlefield. Like the tank and the airplane, gas weapons became commonplace, and because of their prevalence on the battlefield, the U.S. Army prepared for chemical warfare both during and after World War I. As part of the reorganization of the military under the National Defense Act of 1920, the Army added the Chemical Warfare Branch, signaling the importance now placed on the possible use of chemical weapons in future conflicts.[5] Though chemical weapons were not used during World War II, the United States and Soviet Union both continued the development and stockpiling of chemical weapons during the Cold War.[6] As part of the Army Reorganization Act of 1950, the Secretary of the Army continued the Chemical Corps as a separate support branch to ensure that the Army would have the ability to effectively deploy and counter chemical attacks.[7] However, by the 1960s, the Army began developing its Chemical Demilitarization program when the Department of the Army directed that obsolete and surplus chemical weapons be destroyed in a safe manner. In 1971, Congress signed the Foreign Military Sales Act Amendment, requiring destruction of American chemical weapons from the Far East Depot, at Johnston Atoll in the Pacific, at a location outside of CONUS. Since the Marine Protection, Research, and Sanctuaries Act of 1972 prohibited dumping chemical weapons in the ocean, the Army explored the feasibility of on-site disposal methods.[8]

As part of the disposal of chemical weapons, the U.S. Army first focused on the destruction of M34 cluster bombs at Rocky Mountain Arsenal, Colorado, in the early 1970s. This mission provided technical and management experience and aided in the construction of a pilot facility in 1982 using incineration methods at Tooele Army Depot, Utah, the location of the largest stockpile of chemical weapons in CONUS. The Tooele pilot plant facility, the Chemical Agent Munitions Disposal System (CAMDS), proved successful.[9]

To aid in the construction of new disposal facilities, the U.S. Army contracted with the Huntsville Center. The reasons for the Army's choice of the Huntsville Center were numerous. The Huntsville Division had experience with complex facilities and systems engineering and had also worked on the Production Base Support Program, which upgraded aging ammunition production plants. In August 1981, the U.S. Army Toxic and Hazardous Materials Agency signed a

Memorandum of Understanding (MOU) with Huntsville Division to create a program for demilitarization of obsolete chemical munitions. The MOU established general relationships and procedures for Design Systems support for the consistent planning, programming, contracting, design, and construction of demilitarization facilities across the United States.[10] At the time, the planned facilities were only to dispose of aging chemical weapons. However, with the end of the Cold War in the late 1980s, the U.S. government began to examine other possibilities to lower its arsenal, including the demilitarization of all its chemical agents.[11]

After years of negotiation, the United States, Russia, and many other nations signed the Chemical Weapons Convention in 1993. As part of the agreement, Russia and the United States also agreed on a schedule and legal basis for destroying their chemical weapons.[12] After convention approval, DOD leaders explored the proper methods and procedures needed for the elimination of the nation's chemical stockpiles. Initially, the U.S. Chemical Stockpile Disposal Program used incineration to destroy chemical agents at Johnston Atoll and Tooele Army Depot. While this incineration procedure was a technical success, it produced emotional opposition from environmental groups that feared weapons leaks or other public risk incidents related to the incineration process. Moreover, the United States also realized that it needed to assist the former Soviet Union in the removal of Soviet weapons through monetary and technical support; however, the Russians wanted to use their own neutralization process.[13] Ultimately, in 1996, the U.S. government assigned the Huntsville Center to support the chemical demilitarization activities in the former Soviet Union.

Management of the Chemical Demilitarization Program

The management and operation of the Center's Chemical Demilitarization program represented many unique problems. For example, in a 1999 briefing, Huntsville Center officials identified five major challenges to the execution of the Chemical Demilitarization program, including controlling cost and schedule growth, environmental compliance, change-order management, effective partnering, and impeccable quality.[14] New challenges emerged, however, as the missions evolved. For example, working in Russia required engineers and project managers to understand a different culture and political environment. While most of the Center's early work involved construction of the disposal facilities, the Center also advised its clients on the demolition of the facilities and restoration of the original environment as the plants completed their missions. By 2006, the Center delivered a proposal for demolition of agent-free structures and utilities at the Aberdeen, Maryland, site; drafted a proposal for decontamination, demolition, and cleanup of the CADMS at Deseret Chemical Depot at Tooele, Utah; and began offering closure support for other plants.[15]

The Huntsville Center's Chemical Demilitarization construction program continued in its mission to support the demilitarization of the nation's chemical stockpile from 1998 to 2007.[16] The program's primary objective in 1998 was to design and construct U.S. chemical disposal facilities, as well as acquisition and installation of equipment at the eight disposal facilities and one training facility in CONUS and one disposal facility outside the continental United States (OCONUS).[17] By 1998, the Center was fully committed to the tasks, with several facilities already in service and many in the design program. The map presented in

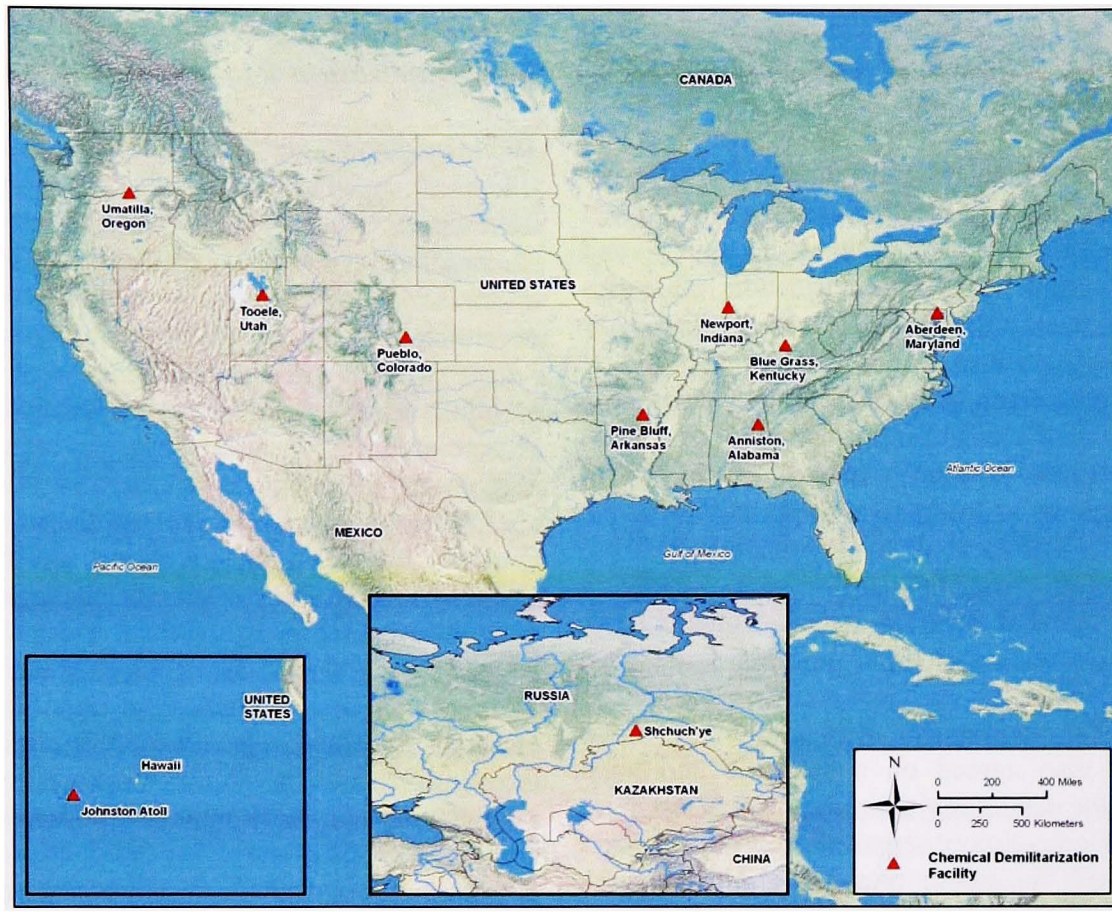

Figure 3.1 Chemical Weapons Disposal Facilities supported by the Huntsville Center.

Figure 3.1 identifies Chemical Weapons Disposal Facilities supported by the Center.

Because of the complexity and scope of the disposal facility construction and its advanced technology, the Chemical Demilitarization mission represented a substantial portion of the Center's budget during the late 1990s and early 2000s. For example, the FY01 budget request of $26.2 million included $6.1 million for contracting support from the U.S. Army Corps of Engineers, the U.S. Army Industrial Operations Command, and the U.S. Army Materiel Command.[18]

Changes in DOD's program management structure altered the Center's management of the chemical weapons mission. Specifically, the Army-wide demilitarization program had undergone a major reorganization in 2001. The DOD revised the disposal schedule, extended planned milestones, and increased program cost estimates beyond the 1998 estimate of $15 billion to $24 billion. Because of these large-scale revisions, the General Accounting Office (GAO) examined the effect of recent organization changes on program performance and assessed the progress made in meeting the revised 2001 cost, schedule, and Chemical Weapons Convention (CWC) deadlines. The GAO found that the DOD's Chemical Demilitarization program had "long-standing and unresolved issues regarding its leadership, organization and strategic planning," including a lack of upper-management stability.[19] Many of the program's actions were not coordinated,

In Their Own Words:

Jim Cox, Director, Chemical Demilitarization Directorate, 1998–2004

I came to the Huntsville Center from Japan in 1996. At that time, we had two directors, the program manager for chemical demilitarization, Jerry Mullinix, and a separate construction director. A couple of years later, Jerry Mullinix retired, as well as his deputy, Jerry Belt. So, the Center combined those and I became the Director of Chemical Demilitarization. We had Anniston, Umatilla, Pine Bluff, Aberdeen, and Newport all under construction at one time. We peaked out at probably a little over 250 people, most of them working in the field offices. It was the largest Department of Defense construction program at the time, and was valued at about four billion dollars (interview with Jim Cox, 2008).[1]

and the program lacked a comprehensive strategy to monitor program performance. The GAO recommended that DOD and the Army adopt a risk-management approach in an attempt to control the program's costs.[20]

Because of the GAO recommendations, the Army created the Chemical Materials Agency (CMA) (Provisional) in February 2003, which combined the storage and disposal of chemical weapons under a single agency. Previously, the Army Materiel Command's Army Soldier and Biological Chemical Command oversaw chemical weapon storage, and the Chemical Demilitarization program oversaw chemical weapon demolition. The creation of the CMA was part of a reorganization directed by Secretary of the Army Thomas E. White, who requested that the Assistant Secretary of the Army for Acquisition, Logistics, and Technology assume overall responsibility for chemical demilitarization for the Army.[21]

Under the CMA structure, the Huntsville Center remained the program's Life Cycle Project Manager for design, equipment acquisition, equipment installation, and facility construction for the chemical demilitarization facilities under construction by the Program Manager for Chemical Demilitarization (PMCD) and those yet to be awarded.[22] While the primary client for U.S. construction changed, the Center's primary support mission did not. Importantly, none of the GAO documents specifically criticized the Center's management within the Chemical Weapons Demilitarization program.

The Huntsville Center's chemical program also experienced a decline in funding from 1998 to 2007. As many of the Chemical Demilitarization facilities came online in the late 1990s, the large expenses required in the early stages of construction were eliminated. In FY98, chemical demilitarization accounted for 43.8 percent ($225 million) of the Huntsville Center's planned obligations. However, by the next year, FY99, that number had fallen to only 36.9 percent of the total amount of expenditures for the Huntsville Center. By FY07, chemical demilitarization had fallen to 16 percent of the Center's obligated funds.[23]

The decrease of funding occurred at the same time that the CMA was accomplishing its mission. By 2 February 2005, the Army had destroyed 11,076 tons of chemical agents, or about 35.1 percent of the total U.S. stockpile, and about 42 percent of all U.S. chemical munitions (primarily rockets and landmines).[24] By August 2006, the CMA had eliminated 50 percent of munitions in the national stockpile of chemical weapons.[25] The Chemical Demilitarization program was unique in DOD

in that these complex industrial facilities were so well designed and constructed that they were able to destroy agents as planned without extensive modifications and with no accidental exposure of workers.

Construction of Chemical Demilitarization Facilities in the United States

From the beginning of the mission, Huntsville Center's primary responsibility in the CSDP was facility design, which later included construction oversight of the multibillion-dollar disposal facilities located across CONUS. As stated before, in 1990, the Corps of Engineers designated the Center as Life Cycle Project Manager for the construction of the chemical disposal facilities primarily because of the Center's experience with large-scale projects and unexploded ordnance (UXO). Beginning in 1992, as construction plans proceeded, the Center also became responsible for construction oversight because it had the necessary skill sets to oversee the construction of these unique facilities. Because of the number of sites for CSDP, construction oversight represented a substantial undertaking for the Center.[26] The USACE authorized the Center as a sunset[27] construction organization to oversee these complex and environmentally sensitive projects in diverse remote locations.

Supported by the Huntsville Center, the Army opened its first chemical agent disposal facility in 1990 at Johnston Atoll in the Pacific Ocean (Figure 3.2). The plant was the flagship for destruction of chemical weapons utilizing incineration technology. The high-temperature incineration technology was the first-generation model of American chemical demilitarization procedures. The demilitarization process started with the dismantling of the chemical weapons munitions into three parts: the agent, the explosives, and some metal parts. Each component group was treated further separately. The Army would destroy "agent combustion in the first chamber of the liquid incinerator at about 2,700 degrees F and additional treatment in the afterburner (second chamber) at approximately 2,000 degrees F [which] leads to the 99.9999 percent destruction and full mineralization of organic compounds; the generated oxides and acid gases are removed" by a scrubber process. The drained munitions cases and the emptied containers were decontaminated by thermal treatment.[28]

Figure 3.2 The Johnston Atoll chemical demilitarization facility just prior to its demolition in 2003 (U.S. Chemical Materials Agency [CMA] photo).

Operations at Johnston Atoll were completed in 2000, and included the destruction of approximately 6 percent of the Army's total chemical agent stockpile. Using lessons learned at Johnston Atoll, the Center designed the Tooele Chemical Disposal Facility in Utah. Based on designs constructed by the Center engineers at Johnston Atoll, including site and process adaptations, the facility went online in 1996.[29]

While Tooele was coming online, Center personnel worked to award contracts and designs for the construction of Anniston

Chemical Disposal Facility in February 1996. The Army awarded the Anniston contract. The Army selected reverse disassembly followed by incineration as the disposal methods at Anniston. The disposal process was under the purview of the PMCD. The next year, the Center began overseeing construction at the Umatilla Chemical Depot in Oregon. The Center had issued the request for proposal in July 1994 for the disposal facility. However, because Oregon did not issue the Resource Conservation and Recovery Act (RCRA) permit for the disposal of toxic waste until early 1997, the Army waited until 10 February 1997 to award the contract.[30] As Steve Lewis, the Huntsville Center's Project Manager for the Umatilla disposal facility, noted, "The public trust demands that munitions be destroyed safely. The eyes of the world are on the chem demil program. The requirements to meet environmental and safety measures are extreme, but necessary."[31] As with Anniston, the Huntsville Center took the lead in supervising the design and construction of the Umatilla facility.

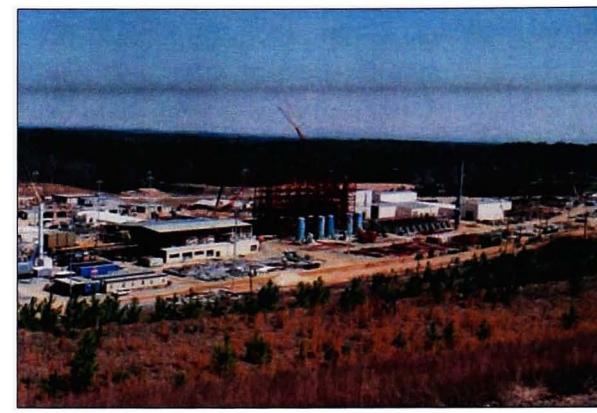

Figure 3.3 Anniston Chemical Agent Disposal Facility, under construction in March 1999.

Figure 3.4 Umatilla Chemical Agent Disposal Facility under construction in 1998.

After several years of design and construction, several of the disposal facilities for which the Center provided construction oversight were completed. The first of the new generation of disposal facilities, the Anniston Chemical Agent Disposal Facility, was completed in June 2001 (Figure 3.3). Jim Cox, Chief of the Huntsville Center's Chemical Demilitarization Directorate from 1998 to 2004, noted, "We have been involved with this program for many years, but this is the first Chem Demil facility that Huntsville Center has managed the construction effort from start to finish. That in itself is a big success for us."[32] While the facility was completed in 2001, the Anniston Chemical Agent Disposal Facility did not become operational in the disposal of nerve agents until August 2003. Approximately five years into operation, Anniston had completed the destruction of the stockpile's nerve agents. As of 2008, the facility is being modified for the destruction of mustard gas.[33]

In August 2001, the Center saw the completion of the Umatilla Chemical Agent Disposal Facility (Figure 3.4). On 10 February 1997, the Army awarded a $567 million contract to design, build, and equip a facility to destroy chemical munitions at Hermiston, Oregon. This stockpile included 3,717 tons of chemical agent and more than 220,500 munitions. The Huntsville Center managed $262 million of the cost, which included construction and equipment installation.[34] Steve Lewis, Huntsville Center's project manager for Umatilla, and Roger Vogler, the Huntsville Center resident engineer, both stated that the Center's expertise in managing large, high-tech projects aided in the

completion of the project on time.[35] Like Anniston, Umatilla did not start disposal of weapons until September 2004. As of 21 May 2008, Umatilla had incinerated 1,255.66 tons of sarin (GB) and VX stocks, representing more than 33.7 percent of the base's stockpile. This included the entire GB agent stored at the depot, contained in more than 155,000 shells.[36]

At the same time that Umatilla was under construction, the Army awarded a contract to construct another chemical disposal plant at Pine Bluff, Arkansas. Of the $512 million budget for the Pine Bluff site, Huntsville managed $206.5 million for construction.[37] Like the Johnston Atoll model, the Pine Bluff plant was designed and built utilizing incineration technology. The Pine Bluff facility was completed in November 2002, three weeks ahead of schedule.[38] The Army began weapons disposal at Pine Bluff in March 2005. By December 2007, the facility had destroyed all of its rockets containing sarin and began processing VX-containing munitions.[39]

Alternative Technologies: Aberdeen and Newport

While incineration technology did work, there was public concern about its safety. The U.S. government ordered the development of a low-temperature, two-stage demilitarization process as an alternative incineration technology.[40] From 1998 to 2007, the Huntsville Center managed completion of several demilitarization facilities and supervised the construction of two new disposal sites. The first of these new chemical weapons disposal facilities was the Edgewood Chemical Activity, located at Aberdeen Proving Ground in Maryland. Since 1941, Edgewood depot stored approximately 5 percent of the nation's chemical agents. In October 1998, the Army awarded the design and construction contract. Unlike the previous disposal plants, Edgewood operated an accelerated neutralization process to destroy the chemical elements. This system was endorsed by local groups as a safer means of destroying weapons. Construction of the Aberdeen Chemical Agent Disposal Facility was completed in 2002, and munitions destruction began in April 2003 (Figure 3.5). In February 2006, Edgewood Chemical Activity conducted the final destruction of a chemical agent.[41]

The other major disposal facility was the Newport Chemical Agent Disposal Facility in Newport, Indiana. Constructed during World War II, Newport Army Ammunition Plant

Figure 3.5 Officials inspect the neutralization reactors at Aberdeen prior to operations startup in 2003 (CMA photo).

produced the conventional explosive RDX. During the 1950s, Newport produced heavy water for the U.S. nuclear weapons program. Beginning in 1961, the plant shifted to chemical weapons manufacturing, producing the entire U.S. stockpile of VX nerve agent. In March 1999, the Army contracted "to provide design, construction, start-up, operations, and closure of the $295-million Newport Chemical Agent Disposal Facility project." The next month, the Army contracted for construction support. The construction of the disposal facility project experienced several delays but was operational on 5 May 2005.[42]

Like the Aberdeen Chemical Agent Disposal Facility, Newport used "a chemical reactor in which the VX is mixed with water and sodium hydroxide, heated to 194°F and stirred using mechanical paddles," rather than traditional incineration to dispose of the chemical weapons.[43] Additionally, the operation plan at Newport required that the Army transport all of the resulting wastewater off site for further treatment. However, since the wastewater contained small traces of VX, most local wastewater plants would not accept it for treatment. Initially, the Army stored the wastewater on site until an acceptable location for its removal could be identified. Local environmental groups filed a lawsuit that delayed the shipments; however, a federal judge dismissed the case. Veolia Environmental Services, Port Arthur, Texas, began to transport the wastewater to its facilities for processing and incineration.[44] By August 2008, the Army had destroyed all 1,269 tons of chemical agent VX at the Newport stockpile.[45] Notably, construction and operation of the Aberdeen and Newport plants accelerated as part of the GWOT, as the United States feared terrorists might obtain materials to build weapons of mass destruction. After 9/11, security concerns also called for the plants to be modified from "fully automated" to "a more manual type" operation.[46]

By 1999, the depots at Aberdeen and Newport began to use neutralization technologies for chemical disposal. The DOD established a new program manager to identify and demonstrate new technologies for destroying assembled chemical weapons at the Blue Grass and Pueblo chemical disposal facilities.[47]

ACWA: Pueblo and Blue Grass

During this historical period, 1998–2007, the Huntsville Center also began providing construction oversight for facilities using new disposal technologies. In 1997, Congress established the Assembled Chemical Weapons Alternatives (ACWA) program as a way "to safely test and demonstrate at least two alternative technologies to the baseline incineration process for the destruction of the nation's stockpile of assembled chemical weapons."[48] To apply low-temperature technologies to the demilitarization of CW munitions, ACWA considered new methods of disposal such as hydrolysis followed by Super Critical Water Oxidation (SCWO); hydrolysis followed by biodegradation; Silver II–Silver in nitric acid, and hydrolysis followed by SCWO with Transpiring Wall Reactor; and Gas Phase Chemical Reduction systems. After much study, ACWA selected three technologies for additional study: Plasma Arc, Solvated Electron Technology, and Cryofracture.[49]

Congress authorized ACWA to manage the development and pilot-scale testing of these technologies in 1999. As part of the new program, the DOD suspended construction of the Pueblo Chemical Agent Destruction Pilot Plant Disposal Facility and the Blue Grass

Chemical Agent–Destruction Pilot Plant, both incineration-based facilities. Congress decreed that construction of the two new plants would only happen at the chemical weapons disposal facility at Blue Grass Army Depot after the Army demonstrated it had evaluated six incineration alternatives.

While incineration was the Army's standard disposal method at the time, the Army conducted additional studies to evaluate the impacts of both incineration and non-incineration methods. After successfully demonstrating three technologies in 1999 and three more in 2000, ACWA determined that four of them—incineration, chemical neutralization followed by supercritical water oxidation, chemical neutralization followed by SCWO and gas-phase chemical reduction, and electrochemical oxidation—were viable for pilot testing.[50]

In consideration of environmental studies and community input, the DOD selected neutralization followed by SCWO for work to be conducted at the Blue Grass Army Depot. In June 2003, the Army awarded a contract for design, construction, testing, operation, and closure of the Blue Grass facility. Construction began at Blue Grass in 2006, but because of funding limitations, the schedule was modified to accommodate design finalization in 2010 and construction completion in 2018.[51]

The development of new technologies mandated by Congress was necessary based on studies published in 2004 that assailed the progress of the CMA project. Because of stockpile destruction delays and increased costs, the Office of Management and Budget (OMB) said that the U.S. Chemical Demilitarization efforts were "ineffective" and might not meet a 2007 deadline for destroying the entire U.S. chemical weapons stockpile.[52] Delays were attributable to several factors, including disagreements between the Army and local communities and state governments, environmental permitting, and safety concerns.[53]

In September 2004, the GAO also stated that the DOD's management of the demilitarization of chemical weapons was plagued by repeated changes in leadership and a lack of a comprehensive strategy that would provide a roadmap and methods of monitoring program performance. [54] The GAO found several problems related to plant safety issues, difficulties with environmental permitting requirements, emergency preparedness plans, and budgeting shortfalls. By 2005, the Chemical Demilitarization program continued to face serious internal problems and delays that DOD officials attributed to budgetary problems. Because of these issues, the DOD suspended design work and construction of pilot projects at the ACWA sites.[55]

While the ACWA projects were temporally suspended, the Center continued to work on the alternative means for chemical weapons disposal. On 27 September 2002, the CMA awarded a Systems Contract for the Pueblo plant. The Systems Contract, used by the Huntsville Center for large-scale projects, is a Performance-Based, Cost Reimbursable, Task Order, Design-Build contract. Under a Systems Contract, the Prime Contractor is responsible for the design, construction, systemization, operations, and, finally, closure of the facility. This allows one firm to oversee the project from the planning stages through facility closure.[56]

In April 2007, the Center completed the designs of the ACWA at the Pueblo Chemical Agent–Destruction Pilot Plant in Colorado. The Pueblo plant was similar in design and scope to the Blue Grass Chemical Agent Destruction Pilot Plant. Huntsville Center Project Manager Bill Craven stated, "Pueblo Chemical Depot stores only mustard agent in

artillery and projectiles, while Blue Grass has mustard agent, GB and VX nerve agents. The technology selected for Pueblo, neutralization followed by biotreatment, is also different."[57]

That same year, the DOD awarded a $130,108,442 Systems Contract for a chemical munitions demilitarization facility at the Blue Grass Chemical Depot to destroy the chemical weapons stockpile stored at the depot. In April 2006, the Center began construction on the Blue Grass Chemical Agent Destruction Pilot Plant. Unlike the other disposal facilities designed by the Center, the Blue Grass plant incorporated elements of the material handling systems that are common to the incineration facilities at Anniston, Pine Bluff, and Umatilla, with the agent reactor vessels at the bulk agent plants. Also, like the Pueblo plant, Blue Grass used a SCWO process to treat the neutralized agent byproduct on site. Terry Stroschein, project manager for the Blue Grass facility, stated that the Center was "using alternative technology, a wet chemistry agent neutralization very similar to the Aberdeen and Newport bulk agent plants... [because the plant has] rockets and projectiles containing three types of agent—GB, VX, and mustard."[58]

However, as mentioned before, the construction of the Blue Grass plant faced a serious lack of funding. Stroschein stated that during the original design, the Huntsville Center lacked sufficient funds. Huntsville Center reviewed design changes as a means to lower costs; however, continued funding delays negated any cost savings that the Army gained from using new technologies.[59]

While the Center completed new disposal facilities and developed new technologies, it also managed the closure of disposal facilities that had completed demilitarization tasks. The chemical agent disposal facility at Aberdeen Proving Ground was the second Chemical Demilitarization facility to complete its chemical agent destruction. In late 2007, the CMA requested closure approval from the Maryland Department of the Environment.[60]

Destruction of Chemical Weapons in the Former Soviet Union

As with its U.S. projects, the Huntsville Center's Chemical Demilitarization program in the former Soviet Union began in the early 1990s. After the breakup of the Soviet Union, there were increasing concerns that nuclear and chemical weapons might fall into the hands of extremists or proliferate among terrorists in the Middle East. To aid in the disposal of these weapons, in July 1992, the DOD entered into an agreement with Russian President Boris Yeltsin's Committee for Conventional Problems of Biological and Chemical Weapons of the Russian Federation Concerning the Safe and Ecologically Sound Destruction of Chemical Weapons. Under this agreement, the United States, Germany, and Italy would assist Russia in the destruction of stockpiled weapons, with the United States providing technical support for destruction of nerve agents.[61]

At the same time, Senators Sam Nunn (D-Ga.) and Richard Lugar (R-Ind.) established the Cooperative Threat Reduction (CTR) program "to secure and dismantle weapons of mass destruction and their associated infrastructure in former Soviet Union states."[62] In 1995, the Assistant to the Secretary of Defense (Atomic Energy) ordered the Army to designate a single office within the Army to serve as the executive agent for the Russian Chemical Weapons Destruction Support Program. The next year, the Army established the Product Manager for Cooperative Threat Reduction. Similar to its participation at facilities in the United States, the Huntsville Center provided

contract planning, management, and on-site program management for construction planning and implementation of the Russian facilities.[63]

The Huntsville Center's first project under the CTR program was the Chemical Agent Analytical Monitoring Laboratory, at the State Scientific Research Institute of Organic Chemistry and Technology in Moscow, Russia. The Center provided oversight for the design phase of the chemical weapons disposal facility in Southern Russia, as well as the construction and renovation of the associated laboratory. Typically, the Corps of Engineers' Transatlantic Programs Center managed overseas construction contracts, but because of the Huntsville Center's chemical demilitarization experience and familiarly with the resources, HQUSACE directed the Center to assume oversight of the lab renovations as well as the construction phase of the Russian Chemical Weapons Destruction Facility.[64] Both of these projects were substantial in terms of labor and funding. In FY99 alone, the Russian Chemical Weapons Destruction Support contract accounted for $34.1 million.[65]

The Central Chemical Weapons Destruction Analytical Laboratory (CAL) project did not represent the typical chemical disposal project managed by the Center. Unlike such facilities in the United States, the Russian project essentially involved renovation of one laboratory within an existing operating laboratory and research facility. The Army awarded the construction and design contracts in October 1996, and the laboratory was completed in January 2001.

While the CTR program progressed, the passage of the Chemical Weapons Convention of 1993 provided an ongoing legal schedule for destroying chemical weapons. Using the Convention and the 1992 agreement, the DOD designed a Russian program to "jump-start" the destruction of nerve agents, which assisted the Russians in the development of a safe, secure, timely, cost-effective, and environmentally sensitive means to destroy its chemical weapons stockpile. After Russia ratified the Convention, American experts traveled to the Khimprom plant in the town of Novocheboksarsk in Chuvashia, which produced highly toxic chemical weapons. The U.S. experts offered assistance in dismantling the equipment in 12 abandoned plant shops where chemical weapons had been produced.[66] This assistance represented only an initial step in the cooperative agreement, and full dismantling of the former Soviet stockpile would take more than a small team of experts. The Corps of Engineers contracted to design and build the CAL, and the Huntsville Center managed the construction phase.[67] In 2001, the project received two engineering awards.[68]

The staggering size of the Soviet Chemical Demilitarization program resulted in slow demilitarization progress. Because of the size of the Russian stockpile and other problems, the CWC twice extended "in principle" interim deadlines for Russia to destroy part of its chemical weapons stockpile. Under the CWC's original terms, Russia committed to destroy 1 percent of its stockpile by 29 April 2000, and 20 percent by 29 April 2002. The executive council of the Organization for the Prohibition of Chemical Weapons, which oversees implementation of the CWC, had also called on states parties that provide assistance to the Russian Chemical Demilitarization program to continue their support.[69]

Soon after the signing of Convention, the Defense Threat Reduction Agency hired USACE to award the contract and provide oversight of construction of chemical weapons disposal facilities in Russia. On 3 December 1996, the Huntsville Center awarded the Russian Chemical Weapons destruction

support contract as a cost-plus, award-fee requirements contract.[70] The contractor's responsibilities included design and construction of the Russian Chemical Weapons Destruction Facility. Terry Burton, the on-site manager for the Russian Chemical Demilitarization Facility, noted, "We are basically building a chemical demilitarization plant that will use a neutralization process to destroy Russian GB and VX nerve agents."[71] While that sounded very concrete, the design team faced many problems related to the harsh climate, and the added problems of working in a foreign country.

Like many chemical destruction facilities in the United States, the facility in Russia was located away from population centers to provide safety in case of an accident, as well as to augment security. The proposed Russian facility was constructed near the small town of Shchuch'ye, located approximately 975 miles southeast of Moscow in the Kurgan region. Initial plans called for the facility to destroy Russia's stockpile of nerve-agent-filled rocket warheads and artillery munitions at the Shchuch'ye depot, which contained approximately 50 percent of Russia's nerve agent munitions. However, this number also represented a mere 14 percent of Russia's declared stockpile of chemical warfare materials.[72]

Based on its experience with chemical disposal facilities at U.S. bases, the Huntsville Center reviewed and assisted in the design by a Russian firm of a destruction facility consisting of two large main production buildings for chemical weapons destruction with a combined capability of eliminating up to 1,700 metric tons of chemical agents per year. As agreed, the United States provided funding for design and construction of the entire industrial complex except one munitions destruction building, funded and constructed by Russia. The United States also funded operational testing and facility commissioning through systemization contracts similar to those used by the Huntsville Center for facilities in the United States. At the conclusion of operational testing, scheduled for December 2009, the facility will be turned over to the Russian Federal Agency, which will operate the plant and be responsible for the destruction of the chemical weapons stockpile at Shchuch'ye.[73]

The construction of the Russian site faced various obstacles not usually encountered at American facilities. A Russian firm designed engineering plans for the plant under the supervision of the Huntsville Center. A Moscow firm worked on a testing facility for the neutralization process. Finally, because Shchuch'ye was a rural farming village of 10,000 people located in western Siberia, a

Shchuch'ye Living and Working Conditions:

The town of Shchuch'ye is a rural farming village of about 10,000 people located in eastern Siberia in the Kurgan Oblast. It sits adjacent to the Trans-Siberian Railroad and Highway about 800 miles east-southeast of Moscow. To get to the site you must fly from Moscow to the nearest commercial airport in Chelyabinsk, which is about 60 miles east of Shchuch'ye. The topography of the area is flat with a high water table and marshland is abundant. There are hordes of mosquitoes in the summer. For about half the year the daily temperature is below freezing, but it can get quite hot and muggy in the summer. Extreme temperatures for the area range from -56F to 104F. The construction site is about 12 miles from Shchuch'ye and there are no housing or logistical support facilities in the area (*Huntsville Center Bulletin*, April 2002).

Russian construction firm built a self-contained construction camp, including warehouses and offices.

While the Huntsville Center continued oversight of the pre-construction process, actual construction (Figure 3.6) did not begin until the Russian government completed six conditions established by the U.S. Congress.[74] According to Chuck Riley, the Center's team leader for the Russian Team, "The project in Russia has been challenging in all those aspects because it is in a very remote location and because we are doing this job as a joint project with the Russians. The bureaucracies from both countries tend to bog us down sometimes."[75]

Figure 3.6 Chemical Weapons Disposal Facility in Shchuch'ye, Russia (U.S. Army photo).

In addition to these basic challenges, Riley commented that "the Russian contractors do not have the same background that is typically found in the U.S. contractors. They are not used to having the degree of surveillance that we typically enforce on a contract. This affects them in the quality of product they produce and the safety measures that they take in performing the work."[76] Again, the Huntsville Center and the Corps had to adapt to the working conditions in a foreign land.

Despite the challenges, the construction project received numerous awards for having more than 7 million man-hours without a lost-time accident. The stellar safety record was achieved in part because the Huntsville Center provided an on-site manager, and the construction contractor also fielded a safety team. The safety team consisted of three U.S. citizens and 12 local Russians who worked to integrate Corps safety procedures for construction into the attitude and culture of Russian workers and subcontractors.[77]

In addition to problems with managing construction on site, the development of the Russian Chemical Weapons Destruction Facility also faced political problems. On 28 December 2002, President George W. Bush signed a spending bill that funded design and construction of the Shchuch'ye facility. However, Congressional funding required Russia to meet the following conditions: the Russian government would provide a "full and accurate disclosure" of its chemical weapons stockpile; demonstrate an annual allocation of at least $25 million for chemical weapons destruction; develop a "practical plan" to destroy the Russian nerve agent stockpile; ratify a law providing for the elimination of all nerve agents at one site; and commit to destroy two particular chemical weapons destruction facilities. Additionally, Congress requested that Russia gain support from other nations to fund and build the infrastructure needed to support and operate the Shchuch'ye facility.[78]

The next year, President Bush signed the FY03 defense appropriations bill, which released funds that had been withheld from fiscal years 2000–2002, "for the planning, design, or construction of a chemical weapons destruction facility" at Shchuch'ye. While Russia had yet to meet each of the six requirements, the Bush administration decided that the events of 9/11 demanded urgency in the removal of former Soviet weapons.

In 2003, the overall responsibility for the Russian program was shifted from the Army to the Defense Threat Reduction Agency (DTRA). As Congress feared, without support from the United States, Russia would not provide sufficient financial support for the Chemical Demilitarization program. For example, in 2003, Russia allocated only 5.5 billion rubles (approximately $140 million), or one third of the program's budgetary requirements, for chemical weapons destruction activities. The 2004 budget provided even less funding, with only 5.4 billion rubles allocated for Chemical Demilitarization programs, or less than 47 percent of the planned funds. According to Victor Kholstov, head of the administrating Russian Munitions Agency, "The overall funding gap in the program for the destruction of chemical weapons in Russia in recent years has come to 18 billion rubles."[79] It became clear that without financial support from the United States and other Western nations, the chemical weapons arsenals in the former Soviet Union would remain possible weapons for terrorists.

Placing greater priority on Russian chemical weapons demilitarization, the DOD requested an increase of more than $34 million, to $450.8 million in the FY04 budget for the CTR program. Senator Richard Lugar, chair of the Senate Foreign Relations Committee, noted that the "Russian stockpiles of weapons and materials are the most likely source for terrorists attempting to acquire weapons of mass destruction. Destroying these weapons at the source is imperative to our national security."[80] The extra funding allowed Huntsville Center personnel to continue construction of the Russian Chemical Weapons Destruction Facility.

The Center's employees did not confine their activities to merely managing construction of the Russian facility. Much as they did in Huntsville, employees stationed in Russia also pursued volunteer work with a local orphanage in Shchuch'ye as a way to give back to the community. Throughout its participation in the Russian demilitarization program, the Center's employees led numerous efforts to collect money or provide food, clothing, and building supplies and materials for the orphanage, which has been in operation since October 2000.[81]

During this historical period, 1998–2007, the Huntsville Center continued to utilize its engineering expertise to design and construct chemical weapons disposal facilities. In 1998, many of the disposal facilities were either already designed or nearing completion. Over the next 10 years, Center personnel oversaw the completion of many sites and turned them over for subsequent operation. In addition, because of a request by Congress, the directorate also managed the development of new chemical weapons disposal technologies to ensure that the disposal process was completed in a safe and economical manner. After the events of 9/11, the Center redoubled its efforts to support chemical demilitarization efforts in both the United States and the former Soviet Union as a means to prevent materials that might be used to develop weapons of mass destruction from falling into terrorists' hands. As Tom Small, Huntsville Center's project manager at the Anniston disposal facility, noted, "When it's all said and done, we will have played a role in history helping to safely destroy weapons that no longer have a place in our world."[82]

Throughout the 1970s and 1980s, the United States adopted new environmental regulations to address contaminated or hazardous properties then occupied or formerly used by the DOD. In 1986, amendments to the Comprehensive Environmental Response and Compensation Liability Act (CERCLA), authorized in 1980, established the Defense Environmental Restoration Program (DERP) and the cleanup of Formerly Used Defense Sites (FUDS). The Huntsville Center's experience with blast-resistant technology design, chemical demilitarization project management, range modernization, and munitions production base support construction rendered it the obvious organization for DERP/FUDS program management.

In 1990, HQUSACE designated the Huntsville Center as the Mandatory Center of Expertise (MCX) and Design Center for Ordnance and Explosives. The Center provided program management, contracting, and design support for ordnance removal activities at FUDS locations, for cleanup required through the implementation of BRAC recommendations, and other munitions response projects. As the Army's MCX and Design Center, the Huntsville Center's ordnance and explosives workload grew steadily, and by 1995, Ordnance and Explosives (OE) emerged as a separate directorate within the Center's organizational structure. At that time, OE also became the Center's first directorate to reorganize into a "team structure" under Colonel John Cunningham's efforts to improve the Center's efficiency and responsiveness. The reorganization allowed all OE functions, such as financial management, design, innovative technology, and explosives safety, to perform as "teams" and communicate laterally.[1]

By 1997, OE work accounted for approximately 8 percent of the Center's obligated budget. For the ordnance removal process, the Center partnered with Rock Island and St. Louis districts to prepare Archives Search Reports (ASR) for FUDS properties. These reports provided an analysis of archival records, historical photographs, and oral interviews to develop a history of the site and identify areas of concern, or locations where the number or type of unexploded ordnance posed the greatest risk. A Technical Advisory Group (TAG), comprised of subject matter experts for ordnance technical design and safety, reviewed the ASR and recommended either no action by the DOD or additional analysis. Once the USACE geographic district programmed funding for an individual FUDS property, the Huntsville Center contracted development of an Engineering Evaluation/Cost Analysis (EE/CA) Report. In the final phase, the Center or an assigned geographic district managed ordnance removal through a qualified UXO contractor.[2]

In 2001, the DOD developed a new programmatic framework for much of its ordnance and explosives (renamed "military munitions") responsibilities (Figure 4.1). At that time, the DOD established a Military Munitions Response Program (MMRP) within DERP that focused and consolidated most munitions cleanup activities at defense sites, including many sites not addressed by previous environmental programs.[3] The objectives of MMRP included developing a list of military munitions sites, developing a prioritization protocol, and setting program

Figure 4.1 As the Army's MCX for Ordnance and Explosives, the Huntsville Center provides expertise for a variety of munitions response projects, including the disposal of small- and large-caliber munitions.

goals with evaluation metrics to address Munitions and Explosives of Concern (MEC), UXO, Discarded Military Munitions (DMM), and Munitions Constituents (MC).[4] Together, program streamlining and realignment allowed the Corps to adopt a holistic planning or "sustainability" approach rather than its traditional compliance-based mission.[5]

While the Army Environmental Center (AEC) assumed primary responsibility for developing the munitions sites inventory, Huntsville Center personnel provided their technical expertise for design, safety, and quality control.[6] The site inventory began in 2001, and contractors evaluated each using a Risk Assessment Code Methodology, developed by the Huntsville Center. This methodology, replaced in 2005 by a Munitions Response Site Prioritization Protocol, provided an assessment of high, medium, or low hazard potential for each site. Following the munitions site inventory, cost estimates for restoration were developed using the Remedial Action Cost Engineering and Requirements (RACER) software, which was also developed and maintained by the Center.[7]

Concurrent to the DOD's realigned framework, HQUSACE re-designated the Huntsville Center as the Military Munitions Center of Expertise (MM-CX). As the USACE MM-CX, the Huntsville Center provided broad programmatic support for the MMRP, including developing and maintaining technical guidance/policy expertise, assisting HQUSACE with program management and procedures, assisting the Corps districts with planning and budgeting munitions projects, providing oversight for FUDS site inspections, and providing periodic status reviews of FUDS properties.

At that time, the Huntsville Center also began delegating or "franchising" execution of its munitions work to other Corps districts. Additional MM Design Centers were also established at USACE South Pacific Division, Omaha District, and Baltimore District. Designated "removal districts" included Los Angeles, Omaha, Sacramento, Baltimore, Louisville, Mobile, Savannah, Honolulu, and Fort Worth. While the Center continued to provide centralized program management and technical expertise for removal and remediation, the decentralized execution process helped the Corps maximize its technical resources and provide the most efficient response to its customers. The MMRP was also designed to accommodate anticipated munitions project growth from Army Transformation sustainability initiatives for new ranges and training lands in addition to another round of BRAC recommendations scheduled for 2005.[8]

Most recently, the Corps integrated these decentralized business practices into a new strategy for Military Munitions Support Services (M^2S^2). Established in 2006, M^2S^2 unified all Corps munitions missions to deliver efficient management and project execution. The mission included clearance in theater operations for military infrastructure

On Stewardship and Commitment:

Raymond F. DuBois, Deputy Under Secretary of Defense for Installations and Environment

DOD fully acknowledges its obligation to effectively respond to the hazards associated with unexploded ordnance. Our continued focus is to protect the health and safety of our citizens, sustain our environmental stewardship, continue effective communication with our stakeholders, and gain a thorough understanding of the gaps in our knowledge (DERP Annual Report to Congress, FY02).

redevelopment, range design and construction, and restoration projects required under BRAC and FUDS.[9] As the MM-CX, the Huntsville Center served as a technical toolbox for all aspects of the military munitions mission.

As part of the M^2S^2 streamlining strategy, HQUSACE merged the Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Expertise based in Omaha, Nebraska, with the MM-CX in November 2007. The new Environmental and Munitions Mandatory Center of Expertise (EM CX) combined four existing divisions: Environmental Science, Environmental Compliance and Management, Environmental Engineering and Geology, and Military Munitions. EM CX Omaha personnel became employees of the Huntsville Center but remained in Omaha.[10]

The EM CX provides a number of support activities, including the preparation and review of HTRW and munitions response policy and guidance, quality assurance review of select project documents, technical assistance to projects, HTRW and munitions response training support, and providing review and evaluation of innovative HTRW and MMRP technology. The Center's EM CX personnel also represent HQUSACE in agency discussions regarding Recovered Chemical Warfare Materiel (RCWM) and serve on HTRW or MMRP groups and committees.

New Technology and Old Munitions

As the USACE EM CX, the Huntsville Center evaluates and recommends to project teams the innovative technologies that facilitate munitions removal and environmental remediation. For instance, the advancement of robotic and remote-controlled equipment during the last decade has provided an additional layer of safety for OE contractors. As Dr. John Potter, Director of the Center's Ordnance and Explosives Directorate from 2005 to 2008, remarked, "If you can control the interaction, you can control the risk." In 2000, the Huntsville Center approved use of the Krohn Mechanical Mine Clearance System. Developed by European Herr Walter Krohn, the system can turn contaminated soils, detonate any ordnance encountered, and yet withstand the blast.[11]

In 2001, the Center conducted its first remote-controlled ordnance removal project at the former Camp Croft at Pacolet, South Carolina. Using a remote-controlled armored bulldozer from the Air Force Research Laboratory at Wright-Patterson Air Force Base (AFB) in Ohio, the Corps safely removed six to 12 inches of topsoil, which contained the highest concentration of ordnance fragments. An excavator equipped with a "long-reach" arm enabled workers to safely transfer the stockpiled soil to a remote-controlled sifter. The equipment, operated by a Mobile Command System (Figure 4.2), is operational within line-of-sight of up to three miles. In addition to providing personnel safety, the

Figure 4.2 Mobile Command System at Camp Croft, 2001.

equipment allowed for more efficient soil removal, faster access to deeply buried items, and a more cost-efficient process altogether.[12]

While some methods emerge from an evolution of technological development, other methods use innovative ideas with low-tech equipment. For example, in 2001, the Huntsville Center teamed with the U.S. Army Engineer Research and Development Center, Sacramento District, and OE contractors to test a new method for reducing detonation fragmentation effects. Previously, if OE contractors determined moving an ordnance item was too hazardous, the item would be covered with sandbags or earth and then detonated, but risked secondary fragments expelled from the blast. The new method, tested at Fort Ord, California, used a filled inflatable kiddie pool covered with a single sheet of plywood. The so-called "kiddie pool demo" proved successful, with the water absorbing the blast effect and reducing the potential for associated fires. In addition, the inflated plastic pool produced no hazardous secondary fragments.[13]

In another low-tech project at Camp Croft in 2000, the Huntsville Center developed a small, portable blast-containment shelter. The shelter, nicknamed Bud Lite, benefited the ordnance removal process by limiting civilian evacuations to a smaller footprint, from 900 feet to 200 feet from the detonation site. According to Huntsville Center Project Manager Karl Blankenship, the evacuations were coordinated through "extensive public involvement," and the portable shelter provided an additional layer of safety to the general public.[14]

The Center also continued to develop and sponsor the development of studies for innovative technology as well as technical bulletins outlining removal procedures and reporting. Many of these documents are maintained on the Center's Web site or through the Engineering Knowledge Online (EKO) database. For example, in 1997, the Center developed a software system, called Mapping Explosive Safety Hazards (MESH), designed to integrate blast effects prediction into Geographic Information System (GIS) mapping. The software, continually updated as new technology allows, predicts blast pressures, fragmentation, chemical agent dispersal, tamping, or burial of munitions. The software system provides a GIS-based tool for engineers to conduct site safety planning prior to munitions removal.[15]

In another example of the Center's ongoing support of innovative technology development, between 2001 and 2004 the Center sponsored demonstrations of locating sensors for digital geophysical mapping (DGM) to locate ordnance items of concern. While DGM had been in use since 1993, its development continued to evolve through additional testing and demonstration. With an estimated one million contaminated acres across the DOD's inventory, it was vital to obtain more accurate mapping techniques that would accommodate different types of terrain and vegetation density. The demonstrations were also designed to assist in the creation of inexpensive, easy-to-use, and consistently accurate navigation systems in determining

subsurface anomalies, or potential ordnance site locations.[16]

The Huntsville Center does not work in a vacuum to develop or advance new technology, but frequently collaborates with other Corps organizations to share their expertise and skills. In 2005, the Center completed a four-year research program with the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, and the Army Environmental Center at Aberdeen Proving Ground, Maryland. This UXO environmental research team developed planning guides, data-processing software, algorithms for identifying targets, improvements for detection systems, and hardware development. Importantly, these advancements allowed for a more effective and cost-efficient remediation process specifically designed to maintain sustainability at active military ranges.[17]

The DOD recognized Camp Sibert as one of the highest-priority sites for environmental cleanup, and the Huntsville Center continued to provide technical and programmatic assistance for RCWM. In 2005, the Mobile District completed a phased investigation of Camp Sibert, formerly used by the U.S. Army to stockpile chemical agents and explosives during World War II. The investigations identified approximately 532 anomalies, or areas that had the potential to contain weapons materiel. While Mobile District provided direct project management, Huntsville Center facilitated public involvement by developing relationships with landowners and provided technical expertise for the methods and equipment used in the destruction process. One piece of equipment included the D2Puff computer program, which uses weather conditions to predict the path of a cloud or plume involving hazardous vapors.[18]

In 2007, the Huntsville Center teamed with the Mobile District and researchers to test new geophysical tools for UXO detection and discrimination at Camp Sibert (Figure 4.3). Funded by the DOD's Environmental Security Technology Certification Program, the new equipment was designed to not only detect the presence of UXO, but also characterize the type of materiel. According to Bob Selfridge, chief geophysicist at the Center, locating buried metal objects is easy, but the difficulty is determining what items are actually munitions of concern. "With the use of discrimination, we will be able to significantly reduce the number of holes (dug) at a site," Selfridge said, "at the same time making sure we retrieved every potential ordnance item. This will reduce the cost and the amount of time spent on a landowner's property."[19]

Figure 4.3 Berkley UXO Discriminator, one of several prototype discrimination tools tested at Camp Sibert.

While munitions response projects at former military ranges are challenging, those conducted on active military ranges present other unique conditions. For example, from 2003 to 2006, the Center and its OE contractors performed clearance operations at Schofield Barracks Military Reservation in Hawaii. Located on the island of Oahu, Schofield Barracks was selected as one of six installations for training of the new Stryker Brigade Combat Teams. To provide realistic field training, modifications to the reservation included "reconfiguring (existing) maneuver

In Their Own Words:

Dr. John Potter, Director, Ordnance and Explosives Directorate, 2005–2008

The work has changed under Grow the Force and MILCON Transformation. Both of those are moving military units onto installations, and they need ranges for their [training] systems. But the military is not buying more real estate. Whether you are adding to the current inventory, or are changing the current inventory, it still is all going to happen on a place that probably had a range before. And you can't go out there and dig and build targets willy-nilly. You have to manage the unexploded ordnance problem first. We have been doing a lot of characterization work to give the range planners an idea of what they are getting into, and also to give them an idea of how they can change the range design, and mitigate the cost of the UXO support (interview with Dr. John Potter, 2008).

areas" and the construction of a Battle Area Complex (BAX) and two Qualification Training Ranges (QTRs).[20]

In 2003, Huntsville Center contractors began conducting visual inspections and conventional MEC surface clearance for the BAX and QTRs, and drafted contingency plans for the potential discovery of chemical munitions. As the operations took place on an active range, the work required "strict coordination and communication protocols" and included modifying schedules so that training would not be disrupted. In March 2005, workers found two projectiles, a U.S. 155mm MkII and a 4-inch Stokes mortar, both suspected to contain the chemical phosgene. Because of this discovery, the remaining clearance operations were required to be conducted under DOD regulations for Chemical Safety Submission (CSS). In addition to the Huntsville Center, the CSS development team consisted of the installation, U.S. Army (Pacific), the contractor, a Technical Escort Unit, the U.S. Army Technical Center for Explosives Safety, and the DOD Explosives Safety Board.[21]

The contractor submitted the CSS to the Huntsville Center for review on 31 March 2005, and approval by all parties to proceed with clearance operations was granted within 40 days. Typically, the CSS process takes a minimum of 17 weeks from inception to final approval by the reviewing agencies, but because of the sensitive schedule of the range clearance in Hawaii, the Center's team would not leave until they had a "solid plan, no matter how many hours of the day or how many days of the week it took." By 22 January 2006, the team had discovered approximately 140 additional suspected chemical munitions (Figure 4.4). Items determined acceptable to move were relocated to an interim holding facility for later destruction. For those items determined unsafe for removal, the Materiel Assessment Review Board at Edgewood Arsenal in Maryland evaluated the field data and sorted rounds that could be destroyed as conventional UXO and those that would require destruction as chemical agents. When

Figure 4.4 Ordnance discovered during construction activities at Schofield Barracks.

the initial MEC clearance operations were completed in 2006, the Huntsville Center and its contractor continued to provide construction support for the Schofield Barracks training ranges.[22]

The Center's program management support and expertise have also been requested outside the United States. In 2000, after unearthing approximately 4,000 ordnance items dating from World War I, the Belgian military stockpiled chemical agents extracted from the uncovered munitions but lacked an inexpensive and efficient disposal method. In 2001, the Belgian Royal Military Academy (RMA) discovered designs maintained by the Huntsville Center and requested the organization's assistance through the Office of the Deputy Assistant Secretary of the Army, Environment, Safety, and Occupational Health Division. The Center's RCWM team collaborated with the RMA and the Edgewood Chemical Biological Center (ECBC) at Aberdeen, Maryland, to test a controlled detonation chamber, called a Donovan Chamber. Huntsville Center maintained safety oversight during the explosions while the RMA conducted air monitoring and ECBC completed analysis. When completed in 2002, the tests proved successful.[23]

Communication

The ordnance, or munitions, removal and remediation process has also evolved to accommodate greater public participation. In 1993, the DOD established Restoration Advisory Boards (RAB), which provide a forum for local stakeholders to communicate and express their concerns for environmental restoration projects in their community. Due to the complexity of these projects, the DOD authorized Technical Assistance for Public Participation (TAPP), a funding source for installations to provide scientific and engineering knowledge for munitions removal/remediation projects. In December 1999, the Corps formalized public participation guidelines in Engineer Pamphlet 1110-3-8. According to Dr. John Potter, stakeholder involvement has also increased "because we have encouraged them to participate; it's easier to address their interests up front than later on." It takes "talking to people and developing relationships," according to Program Manager Bill Sargent. "Make sure [the public] is fully aware of what's happening."[24]

While the responsibility of public involvement for removal and remediation projects lies primarily with the geographical Corps military districts, the Huntsville Center provided OE personnel to participate in public information meetings, safety workshops, and inter-governmental agency conferences. The Center also developed public communication procedures. For instance, in a 2001 report, the Center outlined guidance for communicating risk assessment strategies to stakeholders, who often do not understand why a specific removal response action was selected for a particular site.[25]

The Internet first emerged as a technical partner for OE project management during the early 1990s. By 2008, it served as an integral component to provide environmental documents, technical knowledge, and public safety information for munitions removal/remediation activities. In addition, Web sites for individual projects include the administrative record, site history, GIS mapping data, and a forum for questions (Figure 4.5). The Center also disseminates technical information bulletins and innovative technology pamphlets through its Web site, and the Public Affairs Office has, since 2000, assumed the responsibility of publishing *The Corps Environment*, a quarterly newsletter.[26]

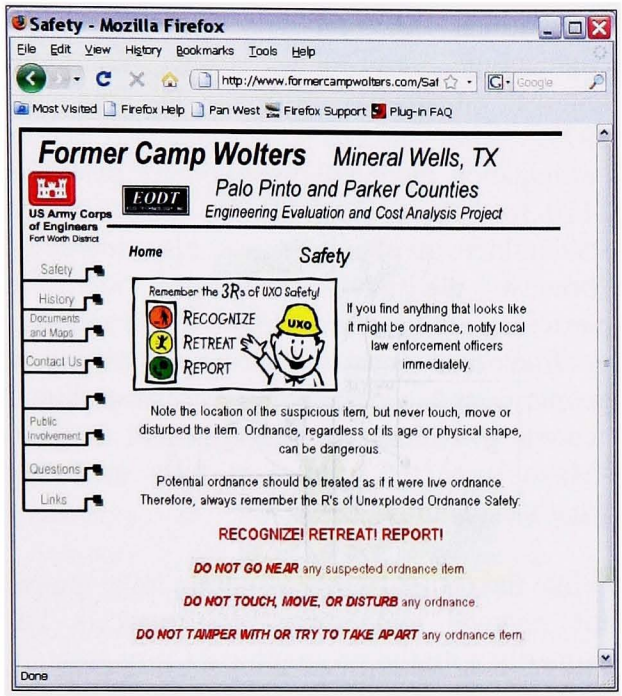

Figure 4.5 Former Camp Wolters Web page.

Beyond the World Wide Web, the Center has utilized the public to disseminate information. For example, in 2001, students of the San Diego City School District in California produced an ordnance-awareness video to inform the public about potential UXO at the former Camp Elliot. Brad McCowan, then Project Manager for Huntsville's OE Design Center, noted the video production promoted "greater awareness of the issue because people they know and trust are part of the video [which] makes it much more interesting and more personal to the community." The script, developed by the MM-CX and contracted through one of the Center's OE contractors, incorporated the Corps' safety guidance regarding UXO.[27]

During this historical period, the Center and its employees received numerous awards for their support of munitions cleanup activities. In 2006, the United States Army Environmental Command (USAEC) recognized the MM-CX with the Design Team of the Year award for its collaboration of the Army Close, Transferred, and Transferring (CTT) Range Inventory project. Partnering with the Baltimore, Omaha, and Sacramento districts, the Center provided quality assurance throughout the inventory process, which demonstrated substantial cost savings for installations. Also in 2006, two Center employees received Special Environmental Cleanup awards. Carol Youkey, Chief of the MM-CX, was recognized by the Deputy Assistant Secretary of the Army for her leadership and management of the Center of Expertise. James Manthey, Program Manager of the MM-CX, was recognized for his support in the Military Response Sites Prioritization Protocol workgroup, a collaborative effort across the military services to develop a risk-assessment prioritization tool for munitions cleanup.[28]

From 1998 to 2007, the Center's responsibilities for military munitions continued to accommodate program management, oversight, and the development and integration of advanced technology for munitions response. As the DOD and Corps moved toward a broader strategy to address munitions concerns at the beginning of the twenty-first century, the Huntsville Center embodied the "One Door to the Corps" vision. The Center's sustained ability to sponsor, maintain, and provide the scientific and technical knowledge for munitions response provided a solid foundation for one of the most high-profile and challenging projects experienced in its four decades of existence.

CHAPTER 5 ▪ *IN SUPPORT of OPERATION IRAQI FREEDOM: Captured Enemy Ammunition and Coalition Munitions Clearance*

On 11 September 2001, terrorists boarded and hijacked four commercial planes, using each to bring a new mode of warfare onto American soil. Both towers of the World Trade Center in New York City collapsed after suffering direct hits by aircraft loaded with aviation fuel, killing nearly 3,000 citizens. In Washington, D.C., another plane struck the Pentagon, and in Pennsylvania, passengers overwhelmed their captors and forced the plane into an unoccupied field. The events of 9/11 sparked what President George W. Bush soon described as the Global War on Terror (GWOT).[1]

While homeland security efforts broadened at home, the United States also sought to use its military prowess against terrorist groups that masterminded 9/11. Osama bin Laden led the Islamic extremist group Al Qaeda, responsible for the 9/11 attacks along with car bombings of American embassies in Kenya and Tanzania and a suicide attack against the USS *Cole*. Bin Laden and Al Qaeda found refuge in Afghanistan, led by the fundamentalist Taliban regime. On 7 October 2001, American air and missile strikes began against the Taliban, initiating Operation Enduring Freedom. Though designed to be a Special Forces operation, by November more than 50,000 U.S. and allied troops were taking part in the campaign.

In addition to ferreting out terrorists in Afghanistan, the U.S. military returned in force to Iraq. Suspected ties to Al Qaeda, accusations of abuses carried out by Iraqi leader Saddam Hussein, and the belief that Hussein possessed and would use weapons of mass destruction led President Bush to insist on regime change in Iraq. In March 2003, the United States launched Operation Iraqi Freedom (OIF) with a series of air strikes, followed by a massive ground offensive. Called "Shock and Awe," the initial coalition assault moved rapidly across Iraq and achieved its objectives in less than one month. Following combat operations, coalition forces under Combined Joint Task Force-7 (CJTF-7) moved to address a multitude of post-combat reconstruction tasks. These "Phase IV Operations" focused on stabilizing security, providing humanitarian aid, and rebuilding the Iraqi infrastructure.[2]

While Hussein allowed the Iraqi infrastructure to decay through 20 years of war, he had stockpiled an extraordinary collection of conventional munitions. Initially, the OIF war plan assumed a low-level risk for conventional munitions and intended to use surrendered Iraqi Army units to secure depots and any weapons caches. However, while coalition forces expected to find weapons of mass destruction, they vastly underestimated both the type and amount of conventional munitions accumulated by the Ba'athist regime.[3] The discovered stockpiles "dwarfed any reasonable conventional combat doctrine" and had been stored in "every conceivable place," including schools, homes, hospitals, mosques, and cemeteries.[4]

By the fall of 2003, U.S. commanders estimated that Iraqi military sites contained between 650,000 and 1,000,000 tons of munitions, an estimate that did not include hidden caches at nonmilitary locations. For example, during initial combat operations in April 2003, the 3rd Infantry Division removed

3.1 million small-arms rounds, 13,700 grenades, 50,000 rocket-propelled grenades, 7,700 artillery rounds, and 19,000 mines from Baghdad. As the U.S. military began Phase IV stabilization operations throughout the country, officials soon realized that troop levels were inadequate to conduct their military duties in addition to securing identified ammunition sites. Testifying before the U.S. Senate Committee on Appropriations, Central Command (CENTCOM) Commander General John P. Abizaid remarked, "There is more ammunition in Iraq than any place I've ever been in my life, and it is all not securable."[5]

Moreover, during their initial sweep through the country, coalition forces used "blow and go" tactics to destroy any captured enemy ammunition (CEA). Military planners had not anticipated such massive stockpiles of munitions, however, and few in-country engineering units had received adequate training to properly dispose of the materiel. According to one analyst, "Many caches destroyed by U.S. military units ended up producing a bigger problem by scattering the contents." Available Explosive Ordnance Disposal (EOD) units were unable to keep up with the increasing workload. The munitions accessible at unsecured sites (Figure 5.1) or that were scattered by inappropriate disposal became a commodity for Iraqis to sell for cash in the depressed economy and a valuable material for insurgents in the making of improvised explosive devices (IEDs).[6]

Figure 5.1 Typical looted bunker, 2003.

By using experienced private contractors to consolidate and properly dispose of the munitions, the DOD argued, military units would be free to fulfill their primary mission of fighting insurgent forces and rebuilding the Iraqi nation.[7] As during the first Gulf War, the DOD called on the U.S. Army Engineering and Support Center to provide its technical expertise, contracting capabilities, and programmatic management.[8] "I think that speaks very highly of the Center and the expertise we have here," said David Douthat, then director of Huntsville's Ordnance and Explosives Directorate.[9] In fact, as the U.S. Army Center of Expertise for Ordnance and Explosives, Huntsville Center was the only organization capable of managing such a large and complex program.

In June 2003, a Huntsville Center assessment team traveled to Iraq to identify customer requirements and prepared a scope of work for the CEA program. Importantly, CJTF-7 directed Huntsville Center to assume all responsibilities of the program within 120 days and provide cradle-to-grave management for munitions collection, transportation, and demolition. The scope of work also called for securing serviceable munitions for the new Iraqi army. By 8 August 2003, the Huntsville Center received funding for the program and awarded $285 million in four initial contracts.[10] The CJTF-7 established the CEA program headquarters at Camp Victory in Baghdad and field operations at six former Iraqi ammunition depots.

Huntsville Center awarded logistics contract to Parsons Corporation, a task order that included equipment, communications, housing, and vehicles. As the first CEA contractor in Iraq,

Parsons also set up a 24-hour manned Operations Center co-located and staffed in Huntsville to facilitate communications and support. Providing materiel support to the large quantity of contractors and locally hired employees in a country whose infrastructure had languished for two decades proved a monumental but not insurmountable task.[11]

Parsons also set up liaison offices at each of the six consolidated depots (Figure 5.2) to facilitate support to the munitions management contractors (EODT, USAE, and TTFW). In southern Iraq, TTFW established operations at An Najaf and Az Zubayr depots. EODT occupied the depots in central Iraq at Paladin and Buckmaster, and USAE set up operations at two depots, Arlington and Jaguar, north of Baghdad. These ammunition storage points (ASPs) had an existing capability for ammunition storage and disposal operations, but many had also been targeted by air strikes.[12]

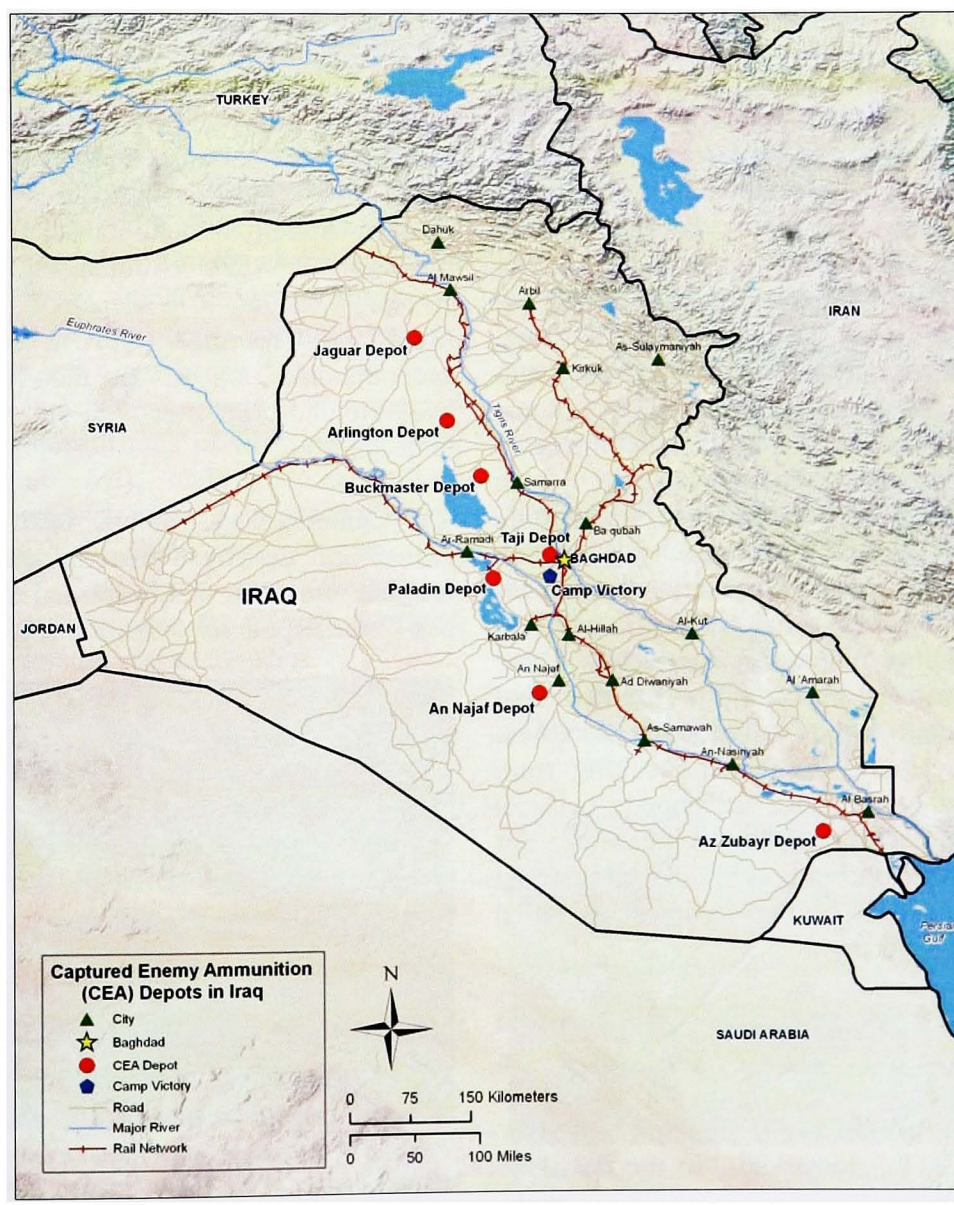

Figure 5.2 CEA depot map.

In selecting demolition grounds at the ASPs, the munitions contractors considered a variety of factors, including proximity to the local civilian population and potential impacts to cultural resources. For example, at Jaguar, contractors conducted a study to ensure that demolition air blasts or shock waves would not damage the Hatra World Heritage Site. Demolition grounds also had to be close enough to the ASPs to provide constant security for personnel transporting munitions to the sites. Despite the lack of environmental sensitivity by the Ba'athist regime, CEA contractors performed all demolition functions according to environmental methods approved in the United States.[13]

While assessing and destroying several hundred thousand tons of captured materiel, contractors encountered a "cornucopia of ammunition." Hussein's regime had secured or purchased the country's arsenal from various nations, including Belgium, Brazil, Chile, China, France, Italy, Russia, Singapore, South Africa, Spain, Sweden, and Yugoslavia. Some of the ammunition dated to the late nineteenth century when the area was part of the Ottoman Empire. Workers also uncovered ammunition from Nazi Germany and more than 3 million rounds of Russian 8mm small-arms ammunition from the mid-1930s. In addition to small-caliber munitions, contractors found bombing materiel that could not be delivered by any aircraft in the Iraqi arsenal. Moreover, loose or scattered propellant resulting from improperly stored or scavenged materiel created an additional safety hazard. For instance, white phosphorus, a difficult material to dispose of in the best environment, liquefied in the Iraqi heat (Figure 5.3).[14]

The first captured ammunition was destroyed on 11 September 2003, and by December, the CEA program had assumed all demolition responsibilities. Brigadier General Robert L. Davis of CJTF-7 remarked, "In the last three weeks alone, recently deployed private civilian contractors have destroyed more than 2.5 million pounds of ammunition, whereas U.S. Soldiers were able to destroy only 1 million pounds in the last six months."[15] By the end of 2004, more than 217,000 tons of munitions had been either secured or destroyed at the ASPs.

During 2004, the Iraqi insurgency matured from a loose organization into a "multifaceted and cohesive network." Anti-coalition forces also capitalized on available materiel to develop IEDs, and "the fact that Iraq was covered with ammunition caches replete with large artillery shells and other types of explosives only aided the insurgent IED effort."[16] By August 2004, Multinational Force–Iraq (MNF-I) refocused the CEA mission from demilitarizing captured munitions at ASPs to collapsing "unsecured remote caches."[17] Renamed Coalition Munitions Clearance (CMC), the program accommodated up to 20 mobile teams to excavate and clear sites with prioritized UXO issues.

The Center's CMC mobile teams evaluated caches and destroyed materiel on site when feasible and safe, or transported the UXO to one of the depots for demolition. Mobile teams

Figure 5.3 Propellant burn from an ammunition storage bunker at the Tinderbox site, 2004.

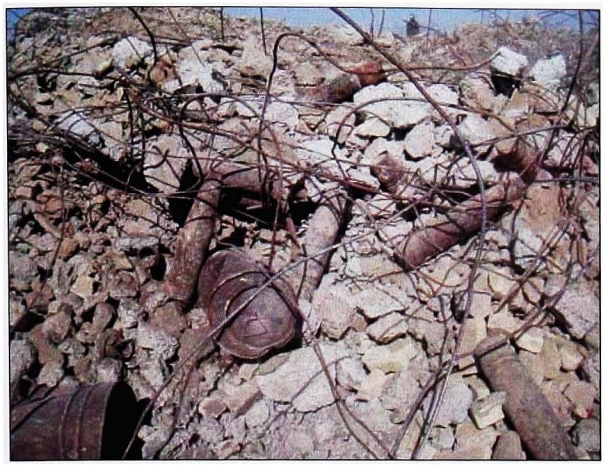

Figure 5.4 Typical collapsed bunker encountered by the CMC Mobile Teams.

set up self-sustaining camps, performed demolition operations, and secured the site upon closure. Any empty shells were buried to prevent being used as IED casings and the coordinates recorded. Remote caches, many of which had been impacted by coalition air strikes, initial ground assault forces, scavengers, and even brush fires, proved a meticulous task. Often, much of the materiel lay buried beneath tons of concrete and steel rebar (Figure 5.4), and workers had to carefully uncover the ordnance before consolidating it into shot boxes for demolition.[18] Contractors also recovered a large quantity of munitions from the surface, unsecured warehouses, or trenches.

With the remote-operating teams, security became an even greater concern, as convoys were susceptible to IEDs placed by insurgent forces. The logistics contractor procured armored Ford Excursions and other equipment to provide an additional layer of security. Despite the precautions, CMC workers remained in danger of IEDs and other insurgent attacks against the remote sites. By the end of 2007, 43 munitions contractors had been killed performing their duties, mostly because of IEDs.

As the CMC team processed munitions, Huntsville Center consolidated the six ASPs into two "legacy depots," Arlington and Buckmaster, both designed to serve the new Iraqi Ministry of Defense. The last official and largest CEA detonation occurred at the Arlington depot in February 2006 and included more than 245 tons of ammunition (Figure 5.5). EODT was contracted to operate the two remaining depots and train Iraqis to maintain, pack, and store munitions. Before the U.S. Army assumed control of the depots, "The Iraqis had no storage or compatibility procedures [and even] high explosive items were stored with detonators."[19]

Throughout the program, the CEA/CMC team employed local civilians to support both demilitarization and life-support programs. For instance, locally hired personnel performed tasks such as removing munitions from storage bunkers, building shot boxes, loading and unloading ammunition from trucks, and conducting maintenance activities on the demolition ranges. This local assistance enabled CMC personnel to meet production goals, augment the local economy, and build "bridges of trust between American and Iraqi personnel." Importantly, the local nationals hired for handling munitions received valuable training for possible long-term employment with the Iraqi Army. The number of participating individuals varied from the start of the program, however, as many locals were

Figure 5.5 Last major demolition at the Arlington depot.

In Their Own Words:

Bill Sargent, Huntsville Center Program Manager

Once the Army realized the amount of ammunition that they had taken control of after Operation Iraqi Freedom began, they realized they did not have the sources, the engineer assets, or the EOD assets to take care of it. They knew it would be a long-term commitment, so they turned to the USACE for help and Huntsville was the only entity within the Corps that had the contract capability to do what they wanted to do. In 2003, we started the planned detonations at the depots to dispose of Saddam's munitions. He had bombs so big that none of his aircraft could carry them, and torpedoes with nothing to shoot them from. They even had small-arm ammunition with swastikas on it from Nazi Germany. Once the insurgency started to ramp up in 2004–2005, our mission switched to mobile team operations. The insurgents were going back and trying to dig the collapsed bunkers to get material for IEDs. The Army set the priority for sites, and we set up our own perimeter and security, and our own living support activities. Digging up some of those bunkers was a huge effort because there was a lot of concrete and rebar steel to get through in order to get the ordnance beneath it (interview with Bill Sargent, 2008).

threatened, kidnapped, or even killed. During the insurgency, in particular, the number of locally employed personnel fluctuated and often affected daily production schedules. The CMC team responded by constructing labor camps near the ASPs with safe housing and a secure environment.[20]

Four years into the program, Huntsville Center's contractors had secured or destroyed more than 400,000 tons of munitions, a "task never before attempted under fire." By using private contractors, the CEA/CMC team enabled coalition forces to use the military for its primary role to stabilize the new Iraqi nation. Moreover, the program successfully removed a substantial amount of accessible IED materiel from insurgents and secured the landscape for both the military and local civilian population. As Colonel John Rivenburgh noted, "Here in the states, we're still cleaning up [UXO] from the greatest generation. So, whatever we do in Iraq today, their greatest generation won't be a victim."[21]

CHAPTER 6 ▪ *CHANGES in the POLITICAL WIND: Huntsville Center's Support of the Ballistic Missile Defense Mission*

In the 1960s, the Huntsville Center originated with the mission to support the development of the United States' antiballistic missile (ABM) defense systems.[1] From 1998 to 2007, the Center once again was active in the design and construction of several test and operational ABM facilities at Fort Greeley, Alaska, and Vandenberg Air Force Base, California, that would become the basis for the National Missile Defense (NMD).[2] In addition to overseeing the construction and rehabilitation of facilities to support the missile fields; the Center also supervised a minor project of construction of new facilities to support the COBRA DANE facility that was needed for the operation of the radar. Changing political leadership and views on the need for an ABM program slowed the design and construction of the NMD infrastructure. However, after the terrorist attacks on 9/11, President George W. Bush removed the United States from the 1972 ABM treaty and accelerated deployment of the defense system to counter possible attacks by "rogue states." Similar to its participation in chemical demilitarization and other high-tech programs, the Huntsville Center provided the U.S. Army with essential technical expertise, as well as the program management skills necessary to complete NMD deployment.

Ballistic Missile Defense to 1997

The Center's design engineering of ABM technology during the 1960s served as the harbinger for future projects and missions. Founded in 1967 to serve the single mission of design management for and construction of facilities needed for the Army's SENTINEL/SAFEGUARD ABM System, the Huntsville Center (then Huntsville Division) later diversified to acquire programs and projects of various levels of complexity and diversity.[3] Following a period of détente in the 1970s, the U.S. military abandoned the development of operational ABMs until March 1983, when President Ronald Reagan proposed the development of the Strategic Defense Initiative (SDI) to counter the growing Soviet nuclear arsenal.[4] During the 1980s, the SDI program invested billions of dollars in the development of several ABM systems, yet no operational systems originated from those appropriations.[5] The SDI program also faced criticism from scientists who questioned the militarization of space, and whether the technology was even plausible.[6] These two arguments against developing a defense system followed NMD throughout its history.

When the Cold War ended in 1989, many military and political leaders no longer recognized a nuclear attack from the Soviet Union as the primary threat to American national security. Following the election of President Bill Clinton in 1992, the defense leadership reexamined ballistic missile defense. In May 1993, Secretary of Defense Les Aspin changed the name of the program from Strategic Defense Initiative to Ballistic Missile Defense Organization (BMDO) and quickly reduced funding of the project until it only contained a very limited System Technology Demonstration (STD). The STD was designed to serve as a "test bed" to develop necessary technology that might be utilized if the program ever was deployed. During 1994 and 1995, the BMDO operated

under a limited budget and barely stayed active.[7]

The renewed focus of the BMD program in 1995 included defense of the United States from an accidental launch or from what would later be termed "rogue states." However, Russia viewed deployment of the system as an indication of American distrust of the former Soviet state, and that the United States did not view it as an international geopolitical leader. Russian officials argued that the BMD system voided the ABM treaty and could start a new arms race. Not wanting to agitate the Russians, the Clinton administration moved slowly in efforts to deploy the BMD system beyond the test-bed stage.[8]

In April 1998, the BMDO selected Boeing North America as BMDO National Missile Defense Joint Program Office's prime contractor for the responsibilities as the Lead System Integrator (LSI). Boeing's proposal included the use of several subcontractors, and was unique in that it called for "partnering" with the U.S. Army Corps of Engineers for the design and construction of facilities to support the deployment of an NMD system. The U.S. Army Engineering and Support Center, Huntsville, served as the primary agent for that work. In December 1998, Major General Milton Hunter, USACE, and Major General Willie B. Nance, NMD Program Manager, signed an official charter recognizing the Corps as a full partner in NMD program development.

Since this project was Military Construction funding, the "teaming" with Huntsville Center was unique.[9] The agreement called for the Huntsville Center to serve as the "one door to the Corps," maintaining the responsibility for program management for all Corps support work throughout the life of the program.[10] The Center's primary responsibility included design of all tactical support facilities for NMD deployment locations in Alaska and North Dakota. The proposed facilities included the X-Band Radar located on a barge in Alaska, support facilities, ground-based interceptor launch and support facilities, and tactical operations and headquarters facilities.[11] Other responsibilities of the Huntsville Center included providing expertise supporting the required electronic security, cost estimating, criteria development, scheduling, acquisition, and construction review.[12]

The design of the facilities depended on the type of booster used by the ABMs. In July 1998, the DOD selected a commercial off-the-shelf booster proposed by Boeing, the lead system integrator contractor for the NMD Ground-based Interceptor (GBI).[13] To test the new system, the Huntsville Center worked with its partners to design launch facilities at the Ronald Reagan Ballistic Missile Defense Test Site, Pacific Ocean. The Huntsville Center provided engineering review for the two missile silos on Meck Island for the booster rockets, designed by Black and Veatch in February 1999. The Honolulu Corps District was responsible for construction management, and its Resident Engineer Office at Kwajalein Atoll, Hawaii, provided on-site quality assurance and safety oversight. By July 2000, Honolulu District had completed the test silos needed to test the new booster.[14]

As the NMD program searched for guidance, many of its previous projects reached completion. In July 2000, the Honolulu District successfully completed construction of missile test facilities, and in October 2001 started construction of an In-Flight Interceptor Communications System Data Terminal (IDT) at the Reagan Test Site, Kwajalein Atoll. The Huntsville Center provided design oversight for both of these facilities (Figure 6.1).[15]

Figure 6.1 Ground-based radar facility at Kwajalein Atoll, Hawaii.

While Huntsville was active in many projects related to missile defense, most were small, test-bed projects used to determine if the technology worked. During this phase of design and construction of test-bed facilities, the fate of the BMD program remained uncertain. In March 1999, legislation passed by Congress committed the United States to deploying a missile defense system. However, on 1 September 2000, President Clinton announced that he would not authorize an NMD deployment, and that he would allow the next president to make that determination.[16]

Rebirth of National Missile Defense in 2001

In 2001, President George W. Bush quickly reordered the security policies of the nation, and his administration's priorities included a renewed focus on and additional funding of NMD development.[17] During its tenure, the Clinton administration placed little emphasis on the program. For instance, the administration's last budget only requested $4.5 billion for missile defense, although Congress eventually approved $4.8 billion. The Bush administration budget, however, requested $8.3 billion for NMD in 2001, and Congress approved $7.8 billion.[18]

In addition to the new funding, Defense Secretary Donald Rumsfeld ordered a restructuring and reinvigoration of ballistic missile defense efforts in 2002, and created the Missile Defense Agency (MDA) to oversee research begun or expanded under SDI for deployment to face new threats. [19] Because of the Bush administration's support, money and contracts flowed for new construction and research and development.

The vacillating situation of the NMD program also resulted in administrative problems at the Huntsville Center. In FY01, the Center estimated that missile defense would account for $26 million. While the Center received only $13 million in direct funding, the missile defense program accounted for 11 percent of the Engineering Directorate's labor hours.[20]

Another minor missile-defense support project for Huntsville Center was the construction of support and site-activation facilities for the rehabilitation of the AN/FPS-108 COBRA DANE radar (Figure 6.2), a passive electronically scanned array installation at Eareckson Air Station at Shemya, Alaska. The United States constructed the radar system in 1976 as a means to verify the SALT II arms

Figure 6.2 AN/FPS-108 COBRA DANE radar.

limitation agreement. While Boeing worked to rehabilitate the radar, Huntsville constructed new communication facilities, including an IDT and Defense Satellite Communications Facilities, as well as barracks and other support facilities. Construction at the isolated island encountered the unpredictable seismic activity in the region, winds that could reach 100 miles per hour, and extremely cold temperatures, which limited construction to two months during the summer. To accommodate the weather, contractors also had to bring all supplies by barge during the summer months.[21]

Construction of the Fields at Fort Greely

In 2001, the Bush administration selected Fort Greely, Alaska, as the site of the test bed of the NMD. Fort Greely, located approximately 100 miles southeast of Fairbanks, was established in 1942 as an Army Air Corps Station and a refueling point for aircraft sent to Russia under the Lend-Lease Program. After the war, the Army deactivated the site but reactivated it in 1948, and then designated it Fort Greely in 1955 in honor of Major General Adolphus Washington Greely. For much of the Cold War, Fort Greely served as a site of the Cold Regions Test Center and the Northern Warfare Training Center. In 1995, the Base Realignment and Closure Commission reviewed the installation. However, because of its location, the Bush administration saved it from closure and retasked it with missile defense.[22]

Because the United States was still under the 1972 ABM treaty, Congressional opponents expressed concern over military construction funding of a missile test bed at FortGreely. In a letter to General Ronald Kadish, BMDO director, Representatives Norm Dicks (D-Wash.), Ike Skelton (D-Mo.), and John Spratt (D-S.C.) wrote that the appropriation bill was for "initial construction of national missile defense deployment facilities and not for construction of test facilities."[23] The 2002 budget justification allocated money for a national missile defense test bed, the result of which would be a violation of the ABM treaty, which outlawed testing.

The primary differences between a test bed and an operational facility are that a test bed allows the military to test the technology and prove a concept, and an operational base could conduct operations and worked on internal power. During design of the Greely Test Bed, the Huntsville Center had to ensure that the facilities were adequate and appropriate for a test bed and not an operational site.[24]

While politicians fought over the deployment of the NMD, the Bush administration continued to gain funding for construction. In FY02, missile defense accounted for 4 percent (approximately $31 million) of the Huntsville Center's obligations.[25] The next year, missile defense accounted for only 2 percent (approximately $26 million) of the Center's obligations.[26]

After the events of 9/11, and the Bush administration's description of rogue states as an "axis of evil," the Department of Defense again requested heavy funding for the NMD program. Congress approved the President's request of $9.1 billion for FY04 missile defense program funding. At the same time, administration officials also announced a plan to spend more than $55 billion for further development and deployment of missile defenses through the end of the decade.

During 2001 and 2002, several events occurred that expanded the NMD mission. On 15 December 2001, the United States

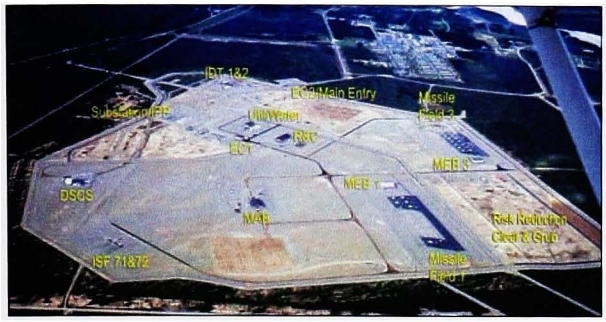

Figure 6.3 Ground-based Midcourse Defense complex at Fort Greely, Alaska.

withdrew from the ABM treaty. A year later, on 16 December 2002, President Bush signed National Security Presidential Directive 23 that ordered the deployment of operational ballistic missile defense systems by 2004.[27]

After removing the United States from the ABM treaty, President Bush announced that the test-bed site at Fort Greely, Alaska, would be the site of the first operational ABM base.[28] In addition to formalizing the system, the administration renamed it the Ground-based Midcourse Defense (GMD), to differentiate the system from other missile defense programs, such as space-based, sea-based, laser, or high-altitude intercept programs (Figure 6.3).

Environmental groups challenged the Army's selection of Fort Greely as the site for the first GMD base, but many Alaskans recognized the economic boom brought by construction work.[29] After much debate regarding environmental impacts, the DOD authorized the construction of the silos for the GMD system in 2001. In July, Secretary of Defense Rumsfeld announced his plans to expedite the testing program, but he assured Congress that the United States was not ready to deploy a system. In August, the Army awarded a $9 million contract for site clearing at Fort Greely.[30]

The Huntsville Center had previously provided oversight for construction of facilities, which included a missile assembly station, an electrical substation, and a control station to support the validation of the ground-based midcourse defense element operational concept aspect of the Ballistic Missile Defense System Test Bed. While Huntsville oversaw the design, Alaska District was responsible for the construction.[31] The work was completed by the 15 June 2004 deadline and, later that year, was determined operational for the receipt of interceptors. Later that year, the missile field was determined operational and started receiving interceptors. The presidential

BMD in a Post-9/11 World:

As the events of September 11 demonstrated, the security environment is more complex and less predictable than in the past. The contemporary and emerging missile threat from hostile states is fundamentally different from that of the Cold War and requires a different approach to deterrence and new tools for defense. In light of the changed security environment and progress made to date in our development efforts, the United States plans to begin deployment of a set of missile defense capabilities in 2004. These capabilities will serve as a starting point for fielding improved and expanded missile defense capabilities later. The Defense Department plans to employ an evolutionary approach to the development and deployment of missile defenses to improve our defenses over time. We will deploy an initial set of capabilities that will evolve to meet the changing threat and to take advantage of technological developments (President George W. Bush, NSPD-23, 16 December 2002).

mandate to stand up the BMD program had been met, and "the Huntsville Center was a key player in making that happen."[32]

After the initial construction, the Center oversaw the design of Capability Enhancement Phase I and II that allowed the site to become operational. This work cost $3.5 million and was completed in the second half of FY06. During the fourth quarter of FY06, the Center started design work on a backup Hemp Power Plant ($6 million design) and Robust Security Hybrid Enhancements ($4.1 million design) at Fort Greely. The next year, Huntsville Center began designing a Defense Satellite Communication System Phase II expansion to accommodate a Second Radome.[33]

To protect against potential enemy attacks, high-altitude nuclear blasts, and earthquakes, the Huntsville Center designed the new buildings with reinforced steel. Additionally, to insulate the base's water pipes from the extreme temperatures, the site included three miles of concrete tunnels connecting the silos, control center, and storage facilities. By 18 February 2005, the Interim Power Plant had been constructed, and by the end of September, contractors completed construction of power feeds to utilities buildings and the first and second missile fields. On 1 September 2005, the Center set up the security around the Second Missile Field. Between June and August 2006, the Center completed the New Entry Control Facility and IDT #2.[34]

Minor Work at Vandenberg AFB

Originally, the national defense deployment plan included the consolidation of all ABM missiles at Fort Greely. However, in 2002, the DOD decided to deploy four ground-based interceptor missiles at Vandenberg AFB, California, by December 2005 to support the 16 interceptors located at Fort Greely. This work was to provide operational realism to the testing at Greely. Together, the 20 interceptor missiles were designed to serve as the initial deployment of the larger GMD system, which would eventually protect all 50 states from long-range ballistic missile attack.[35] As it did at Fort Greely, the Huntsville Center provided design oversight of the rehabilitation for support facilities at Vandenberg AFB. Since Vandenberg already had missile launch support facilities, Huntsville Center only had to reconfigure the buildings for new uses. Compared to the work at Greely, this was a minor project and required no new construction except for the IDT.

While Boeing constructed the missile fields, the Huntsville Center provided design oversight for the modification of buildings and structures at Vandenberg. In February 2004, the Center awarded a contract for the demolition of outdated structures and buildings, and by June contractors had completed the Relocatable IFICS Data Terminal. As with the Alaska work, Huntsville provided the designs and the oversight, but the Los Angeles District provided the construction. During late 2004 and early 2005, Los Angeles District contractors completed several support structures, including the security center, four launch facilities, interceptor storage igloos (Figure 6.4), and administrative buildings.[36]

Following the rush to deploy missile fields at Fort Greely and Vandenberg, missile defense work at the Huntsville Center declined. By FY06, missile-defense program funding reached $23.5 million in contract work, yet by the next year, FY07, less than 1 percent of the Center's budget went to missile defense. Under a 2007 reorganization to accommodate anticipated workloads, the new Installation Support and Programs Management Directorate absorbed Ballistic Missile Defense

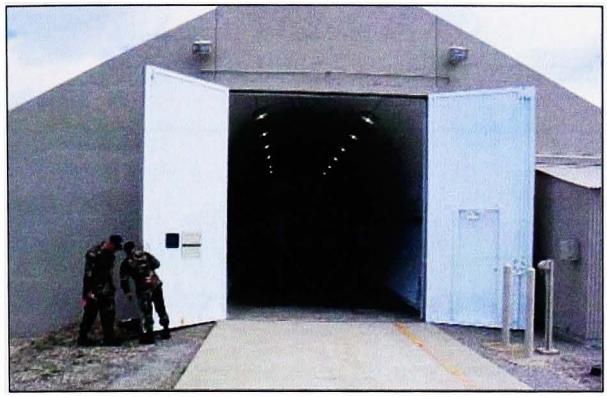

Figure 6.4 Storage igloo at Vandenberg AFB.

as a division.[37] As part of this realignment, in February 2007, the Center selected the former Director of the Ballistic Missile Program, John Matthews, to serve as the new Deputy for Program and Technical Management.[38]

Because the Huntsville Center was created to support the development of ABM weapons, it was only natural that the Center served as the Corps' lead in the construction of facilities for National Missile Defense during the 1990s and 2000s. The program was challenged by unpredictable scheduling caused by political discord, but after the Bush administration finally ordered NMD deployment, Huntsville Center assisted in the design and construction of missile silos and launch facilities at two bases.

CHAPTER 7 ▪ *FOR the SOLDIERS' COMFORT: Installation Support and Medical Programs*

The massive military expansion of World War II and the Cold War left the Army with a web of system redundancies and facility excess. By the early 1990s, the Army faced the extraordinary challenge to reduce, renovate, or modernize its outdated infrastructure. During the immediate post–Cold War period, military spending dwindled, and funding traditionally provided for operation and maintenance needs was often redirected to training or other contingency priorities. In addition, the vision of Army Transformation demanded that installations become sustainable power projection platforms. Ultimately, the Army was forced to delicately balance expensive and complex installation management components yet not interfere with military efficiency.[1]

In 1997, the Secretary of Defense issued a Defense Reform Initiative (DRI) report outlining plans to streamline the DOD into a more efficient and cost-effective organization.[2] Many of the report's initiatives, such as the privatization of utilities and the reduction of excess square footage in the military's real property inventory, affected the Corps' installation support activities. Moreover, the 9/11 terrorist attacks reemphasized many of the DRI policies under the broader themes of security and sustainability.

During the late 1990s, the U.S. Army Corps of Engineers reorganized its Directorate of Military Programs to include life-cycle management, or cradle-to-grave, support for Army installations.[3] This reorganization replaced the U.S. Army Center for Public Works with the USACE Installation Support Division. Then, in 1999, HQUSACE directed the Huntsville Center to service the Army's installation support activities. In 2007, the Huntsville was officially designated the Army's Installation Support Center of Expertise (ISCX). This restructuring served as a watershed moment in the Huntsville Center's history and workload, as it effectively consolidated and built upon many of the organization's existing programs.

Installation support activities represented the Huntsville Center's fastest-growing product line over this historical period. Specifically, by FY07, installation support activities accounted for more than half of the Center's obligated budget. The ISCX managed a variety of support programs including Facility Planning and Programming, Energy Savings Performance Contracting, Electronic Security Center, Facility Repair and Renewal, Facilities Reduction Program, Medical Repair and Renewal, Range and Training Land, Utility Systems Privatization, and Furnishings.

The exponential growth of the Center's installation support activities can be attributed to many of the Army's post–Cold War reorganization and streamlining efforts. Policy directives related to Army and Military Construction (MILCON) Transformation, BRAC implementation, and the increased national demand for energy conservation and independence directly affected the Center's support programs. For many years, Chemical Demilitarization projects accounted for nearly half of the Center's workload, and with those projects near completion, the Center "migrated to the new work" and built on existing programs for the new military environment.[4]

Energy Programs

Many of Huntsville's existing energy programs, such as Energy Savings Performance Contracting (ESPC) and Utilities Privatization, emerged during the 1980s and early 1990s through proactive efforts by the U.S. Army to address funding limitations and the increasing demands of its outdated infrastructure. Privatization projects during the mid-1990s at Fort Leonard Wood, Missouri, and Fort Belvoir, Virginia, proved to be successful efforts. DRI Directive No. 9, issued in 1997, directed the privatization of all government-owned utility systems (electric, water, wastewater, and natural gas) "except those needed for unique security reasons or when privatization is uneconomical."[5] Additionally, Executive Order 13123, signed by President Bill Clinton in 1999, set new standards for federal government energy management and established consumption reduction goals.[6]

During the first decade of the new millennium, the United States placed increased emphasis on "energy independence," and in 2005, President George W. Bush signed the Energy Policy Act (EPA 2005) into law. With skyrocketing oil and energy costs, the DOD represented the United States' largest energy consumer, with approximately 22 percent of that consumption attributed to buildings and facilities. In FY06 alone, the DOD spent $3.5 billion on infrastructure energy costs. EPA2005 set new standards for the federal government, including a 20 percent reduction of energy consumption by FY15, and directed federal agencies to meter their electrical use. In a historical parallel to the energy crisis of the late 1970s, the Huntsville Center benefited from its programmatic charter, developed new programs, and built on the old programs.[7]

For new policy directives regarding privatization of utilities, the Center provided an efficient channel through which installations could contract with local energy service providers. As technical manager Keith Burleson noted, "We try to assist and guide customers in making an evaluation as to whether a contractor can own, operate, and maintain a utility system better than the government." "This is a one shot deal," according to privatization project manager Stan Sillivant, "so it may be cheaper and easier for commands and installations to come to us (for the unique expertise required) rather than develop their own studies and contracts."[8] Those initial studies determined whether privatization offers a feasible alternative and, if so, Huntsville assisted in the contracting efforts.

In one of the first Utilities Privatization efforts for the Army following the DRI directives, Huntsville provided support to Fort A.P. Hill, Virginia, in 1998. Huntsville worked with Baltimore District and the local Defense Contract Audit Agency to negotiate privatization with the Rappahannock Electric Cooperative (REC). Completed in 2002, the project transferred the ownership, operation, and maintenance of approximately 200 miles of electric distribution lines from Fort A.P. Hill to the REC.[9]

The ESPC program, authorized by Congress in 1992, allows for a partnership among the USACE, government facilities, and private entities. In this program, the contractor funds and provides capital investment, construction, operation, and maintenance of new energy products. The contractor then shares the resulting profits with the government for a period of up to 25 years. From 1998 to 1999, ESPC investment rose from $13 million to $104 million, most of which could be attributed to the Center's 18 contract solicitations in 1996 and 1997.[10] Between 1998 and 2007, the Center awarded ESPC contracts for 22 Army installations that

resulted in $328 million in contractor-financed infrastructure improvements.[11]

For example, in 1999, the ISCX awarded one of the largest ESPCs for construction and operation of a $30 million steam plant at Tobyhanna Army Depot in Pennsylvania. According to the Center's Plyler McManus, funding limitations had "restricted the depot's ability to keep up with the maintenance of an aging system." The awarded contract provided replacement of the World War II–era steam plant with modern boilers fired by natural gas. The contractor provided a seamless transition to a cleaner-burning fuel system, and the depot realized $5 million in cost savings.[12]

In 2001, an ESPC contract at Fort Richardson, Alaska, included an implementation cost by Honeywell International of approximately $27.5 million. The project decentralized the installation's heating plant and replaced it with individual natural-gas-fired systems in 237 buildings. The installation's energy cost savings for the first year included $828,000 with ancillary savings of $1.5 million. The U.S. Military Academy at West Point, New York, also used an ESPC administered by Huntsville to replace central power plant boilers and a new natural gas pipeline. The project, completed in 2004, generated $1 million in costs savings during its first year and garnered the Academy the 2004 Federal Energy Award.[13]

Since 1999, the Center's ISCX has also collaborated with the U.S. Army Regulatory Law Office to obtain fair and reasonable utility costs for Army installations. For DPWs, utility costs represent one of their largest expenses, and through the Utility Rate Intervention program, installations can appeal rate changes before state utility service commissions. Through its contractors, the Huntsville Center represents the Department of the Army and its installations with rate negotiations before regulatory agencies, such as the Federal Energy Regulatory Commission, and state and local energy providers. The Center's contractors provide litigation support, expert witnesses and testimony before the regulatory bodies. While the Center receives only a few cases annually, from 1999 to 2008, 49 intervention requests resulted in $88 million in savings for the military.[14]

HQUSACE established Huntsville Center as the Utility Monitoring and Control Systems Mandatory Center of Expertise (UMCS-MCX) in 1991. Using Indefinite-Delivery, Indefinite-Quantity (IDIQ) contracts, the Center provides life-cycle management for automated utility systems, controls, and maintenance, including heating, ventilation, and air conditioning (HVAC) systems and Fire and Life Safety systems. Between FY02 and FY07, the Center's UMCS workload included more than $300 million in awarded contracts.

In one of its more high-profile projects, the ISCX provided technical and procurement contract services for the repair and modernization of UMCS for the Pentagon's Wedge 1, encompassing 1 million square feet (Figure 7.1). At the time the initial IDIQ contract was awarded in 1996, most new private construction began to incorporate computer-based or automated controls to develop "smart buildings." Developing a monitoring system at the Pentagon included the challenge of integrating approximately 100,000 instrumentation points with the building's remote-delivery facility. Completed in March 2001, the Wedge 1 project included the integration of reliable electrical, fire alarm/smoke control, air conditioning, and ventilation systems. The UMCS team also completed the Building Operation Command Center (BOCC), containing three large monitoring screens, which proved vital during the 9/11 terrorist attacks. The UMCS team continued work on the remaining wedges

Figure 7.1 Pentagon renovation.

through 2007, and supported design of the waterlines and lighting units for the Pentagon Memorial.[15]

During the latter part of this historical period, the ISCX acquired additional energy and utility programs, including the Utility Systems Surveys (USS), Energy Engineering and Analysis Program (EEAP), and Army Metering Program (AMP). During its first three years (FY04–FY06), the USS analyzed the utility rates for 42 installations and identified $12.7 million in cost savings. Those savings were achieved through correct tariffs, demand-side management actions, or the use of energy-management control systems.

Funded by the Installation Management Command (IMCOM), the EEAP program assisted garrisons in meeting the energy reduction goals established by EPA 2005.[16] The ISCX worked with the USACE Construction and Engineering Research Laboratory (CERL) in Champaign, Illinois, and the Department of Energy's Pacific Northwest National Lab in Richland, Washington, to perform building surveys to identify energy-saving strategies for the installations. These savings were achieved through optimizing energy transfers to and from climate-controlled spaces or by simply maximizing window size for additional sunlight. An EEAP study at Fort Polk, Louisiana, in 2007 identified 247 individual conservation measures, including improvements to insulation, heating, and air conditioning. Estimated savings included $3.6 million per year in energy costs and $547,000 in maintenance while reducing energy consumption by 26.2 percent annually. A similar study conducted at Rock Island Arsenal, Illinois, identified savings of $21.8 million and a 25 percent reduction in energy consumption. Once installations obtain funding through IMCOM, they can use Huntsville's existing UMCS or Repair and Renewal contracts for implementation.[17]

The AMP program, established and funded by IMCOM in 2006, analyzes energy use and consumption reduction opportunities. An implementation plan for AMP was developed during FY07, and the $23 million in FY08 funding included installation of advanced meters for electrical and natural-gas systems at 22 military installations. In its first year, the program identified $26 million in potential savings at installations in five states. According to Program Management Directorate Director Charles Ford, "When completed in 2012, the Army will have one of the world's largest advanced meter networks for monitoring energy consumption," through real-time data and accountability.[18]

Army Transformation

The policies of the Defense Reform Initiative Report also included the reduction of excess square footage of buildings from the military's real property inventory. In an effort to become sustainable and "green," the removal of 80 million square feet of building space posed a challenge to installation Departments of Public Works (DPWs). During the 1990s, installation landfills began reaching capacity, and permitting new or expanded landfills became more difficult with restrictive environmental regulations.[19] While the DOD had encouraged the reuse and recycling of materials, a 2006 Assistant Chief of Staff for Installation Management (ASCIM) policy established a 50 percent diversion rate for five major categories of material: wood, metal, masonry, asphalt, and concrete. Moreover, sustainability policies for the U.S. Army require a one-for-one, or balanced, ratio for new construction projects. Under this directive, for every square foot of new construction, a proportional amount must be eliminated from an installation's real property inventory.

In 2004, the Installation Management Agency (IMA) assigned management of the Facilities Reduction Program (FRP) to the Huntsville Center. The goal was to realize economies and efficiencies through Huntsville's centralized program management and decentralized execution, carried out by the Corps' geographical district. Army demolition goals included the substantial reduction of an estimated 132 million square feet of "excess" inventory (Figure 7.2). In FY06 alone, the FRP program removed 613 buildings, or 2.38 million square feet, at an average cost of $9.10 per square foot.[20] Between FY04 and FY06, Huntsville assisted the Army to realize more than $7.3 million in cost avoidance savings at seven installations.

Importantly, a significant portion of the cost avoidance savings was achieved through successful waste-diversion measures. As

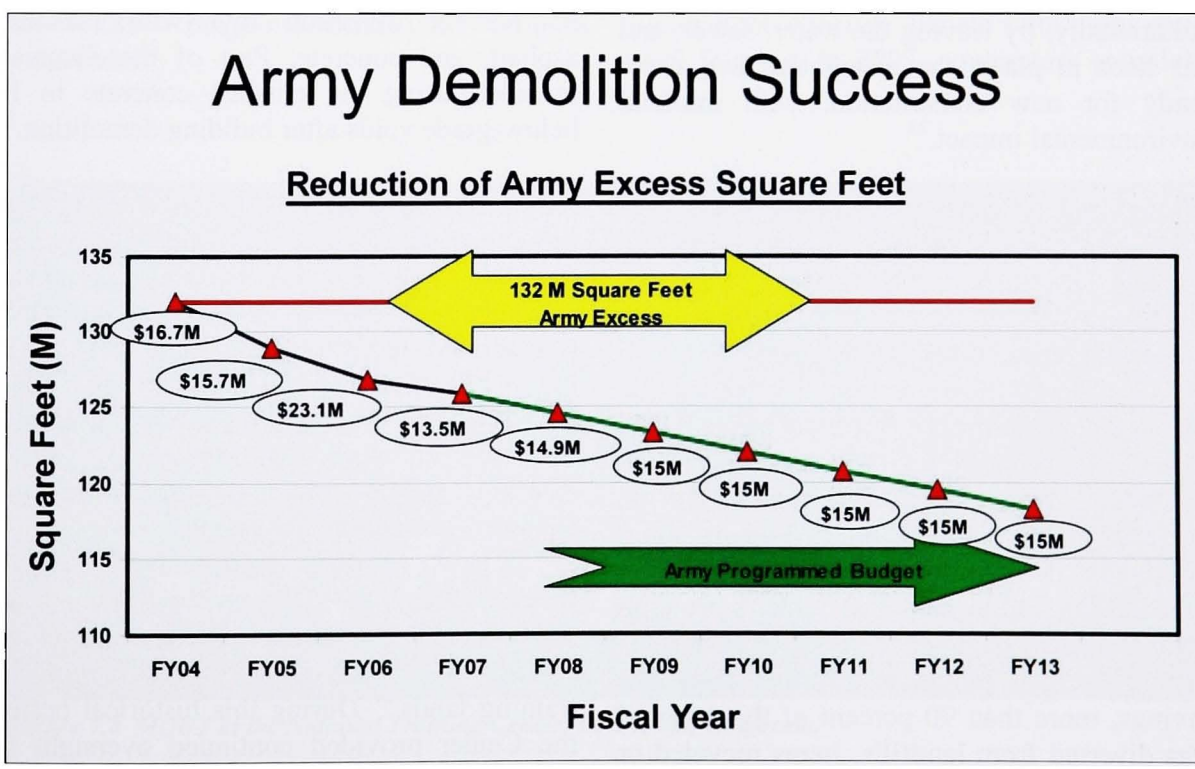

Figure 7.2 The Army's anticipated square footage reduction between FY04 and FY13.

Mirko Rakigjija, Director of the Installation Support Directorate from 1999 to 2006, noted, "At some point there is an optimum number for recycling. We moved to be maximally economical and recycle at 50, 60, or 70 percent. We wanted to save money and the Army Environmental Center wanted recycling as well."[21] Huntsville Center developed Public Works Technical Bulletins (PWTBs) that outlined deconstruction methods. This information was also disseminated through an online Best Practices Toolbox.[22] The toolbox provided estimation procedures for both demolition costs and solid-waste diversion.

Many of the buildings slated for demolition in the real property inventory were temporary wood buildings constructed during World War II. At Fort Polk, Louisiana, the ISCX supported Fort Worth District in the removal of 58 World War II–era buildings and 294,148 square feet through a $1.3 million contract. Waste diversion efforts included recycling most of the concrete for use as a road base and crushing wood as a defoliant at fence lines. Additionally, by leaving the water, sewer, and gas lines in place, the installation has a site ready for new construction, with minimal environmental impact.[23]

While the Huntsville Center routinely contracted for a variety of deconstruction projects, its work at Fort Myer, Virginia, illustrated one of the more challenging and successful waste-diversion projects. In 2006, the Center collaborated with the Installation Management Command, the Fort Myer DPW, USACE Baltimore District, and contractors to implode Tencza Terrace (Figure 7.3), an outdated 12-story personnel housing unit. Originally, demolition costs were estimated at $3.1 million, but through the Center's program management, that cost was reduced to $1,760,000. In addition to the monetary savings, more than 90 percent of the material was diverted from landfills. Items recycled or reused included windows, doors, sheetrock, cabinets, piping, fixtures, metal, and concrete and steel rubble.[24]

Figure 7.3 Implosion of Tencza Terrace, 2006.

Another project, completed in 2007, included building demolition at Fort Hamilton, New York. Using an IMCOM Northeast Region IDIQ contract, the Huntsville Center identified a contractor to perform the work for $1.5 million, roughly half of the original cost estimate. Moreover, the contractor achieved a 95 percent diversion rate with masonry, asphalt, and concrete. Part of the diversion included using the crushed concrete to fill below-grade voids after building demolition.[25]

Solid waste diversion can was also achieved through the relocation of buildings, a task successfully accomplished at Fort Huachuca, Arizona, in 2006. The Fort Huachuca DPW worked through Huntsville to dispose of 17 buildings from its real property inventory. Removal of the buildings was originally budgeted at more than $150,000, but by offering public bidding, the installation achieved 100 percent diversion.[26]

Since 1981, the Huntsville Center has supported everything from program management and engineering to ranges and training lands.[27] During this historical period, the Center provided continued oversight for the Range and Training Land Program

(RTLP), which provides support to Army G-3 for the Army's Range Modernization Program. The RTLP assists with planning, site development, and construction programming and design to standardize the training values of the Army's ranges. The Huntsville Center's involvement begins with preparation of DD Form 1391, the initial project document form, and verifies that the project design meets the Army's standardization requirements for ranges. In cooperation with the Army, the Center develops design manuals for range components, including range control facilities, battle simulator centers, multipurpose range complexes, infantry ranges, and urban terrain facilities. The Center also reviews the designs to ensure that they meet standardization requirements. In 2002, the Center partnered with the Alaska and Honolulu districts to assist in the planning, programming, and project design of stationing for the new Stryker Brigade Combat Teams, an integral element of Army Transformation, at Fort Richardson, Alaska, and Schofield Barracks, Hawaii. By the end of 2007, the Center supported more than 285 range-modernization projects worldwide.[28]

From 1997 to 2002, Huntsville partnered with the USACE Louisville District and the U.S. Army Aviation and Missile Command to develop the Zussman Village training range at Fort Knox, Kentucky. Called a Military Operations on Urbanized Training (MOUT) complex, the design incorporated the use of mechanized vehicles as well as special effects, such as burning cars and buildings. Situated on 30 acres, the simulated urban environment also included government buildings, schools, and hotels.[29]

Huntsville also supported development of the Army's largest MOUT complex, consisting of 232 buildings, at Fort Irwin, California (Figure 7.4). Planned in advance of the GWOT, Army officials prioritized construction of the project following 9/11. The original budget for Phase I of the project could not accommodate the initial contract bids, which forced planners to reevaluate their design and construction methods. Ultimately, the Fort Irwin MOUT team was able to accommodate the same number of buildings by utilizing precast lightweight concrete panels with light-gauge steel framing. In 2007, contractors completed

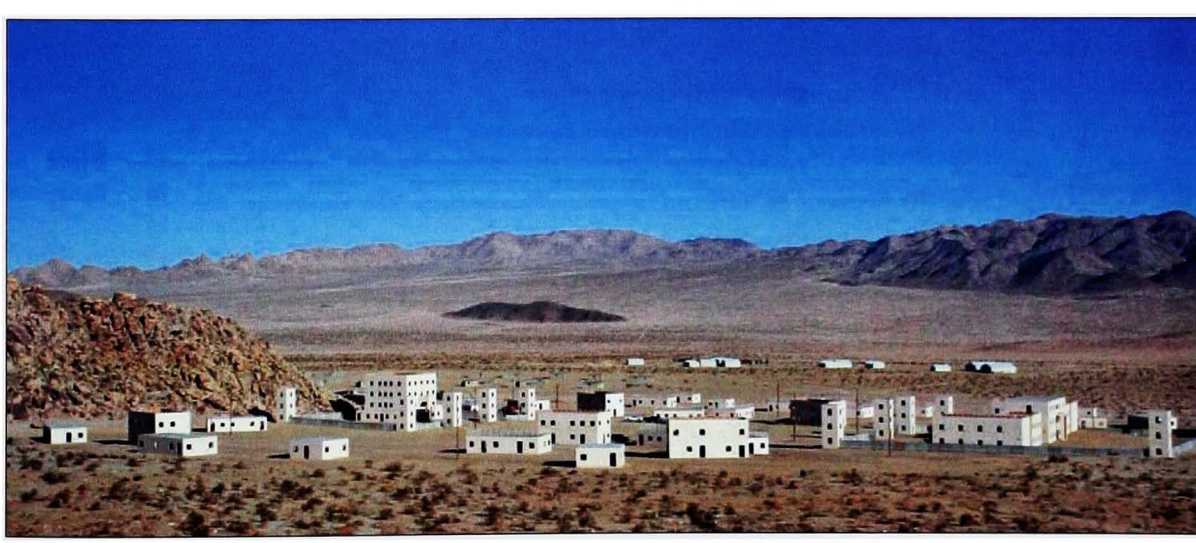

Figure 7.4 MOUT at the National Training Center, Fort Irwin, California.

In Their Own Words:

Mirko Rakigjija, Director of the Center's Installation Support Directorate, 1999–2006

That is why Huntsville Center is very valuable to the USACE. There is no agency that does things nationwide or worldwide. Some things lend themselves to standardization. And the districts can't be specialized in a type of range that they may build once every 20 years. Huntsville can be an expert because there are 10 that will be built in the next few years, and once you build one, you have the expertise to do the rest. The medical program is similar. Districts cannot have the expertise to build hospitals when you do one every 20 years, and the same thing for when you do a medical clinic or a veterans' clinic. That's the reason why the Center's standardization adds value to the districts and to the customers (interview with Mirko Rakigjija, 2008).

construction of Phase I, including 41 main buildings and 24 smaller structures, at a cost of $12 million.[30]

In 2006, the DOD established Military Construction (MILCON) Transformation, with the goal of completing high-quality construction projects 30 percent faster and 15 percent cheaper than previous standards. Key to the Corps' MILCON Transformation implementation strategy are Centers of Standardization (COS), or the idea that certain facilities throughout the Army's new building inventory should share the same design standards, with flexibility for exterior architectural variety. Using standardized designs enables the Army to lower costs and expedite construction. The COS design-build process includes the use of Army standard designs criteria, development of DD 1391s for standard facilities, planning charettes, and establishment of IDIQ adapt-build contracts.

Contracts for the facilities, while awarded by the designated COS, are administered by the geographic USACE district. Funding for MILCON Transformation, while in its infancy, is expected to exceed $50 billion as a result of new military initiatives (Army Modular Force, Global Defense Posture and Realignment, and Grow the Army), in addition to 2005 BRAC recommendation implementation. Again, the Huntsville Center's programmatic and nationwide charter provided HQUSACE with an appropriate framework for much of the standardized work. As of the end of this history (2007), HQUSACE had designated the Huntsville Center as the COS for the following MILCON facility types:

- Medical Facilities
- Correctional Facilities
- Child Development Centers (infant to 5 years and 6 to 10 years)
- Youth Activity Centers
- Army Community Service Centers
- Physical Fitness Centers
- Bowling Centers
- Outdoor Sports Facilities
- Fire Stations
- Consolidated Fire, Safety, and Security Facilities
- Hazardous Waste Storage Facilities
- Close Combat Tactical Trainers
- Military Operations Urban Terrain Facilities
- Training Ranges
- Training Support Centers
- Battle Command Training Centers

The Smith Fitness Center at Fort Benning, Georgia, represented one of the first COS projects using new design criteria (Figure 7.5). Jay Clark with the Huntsville Center's Engineering Directorate worked with the U.S.

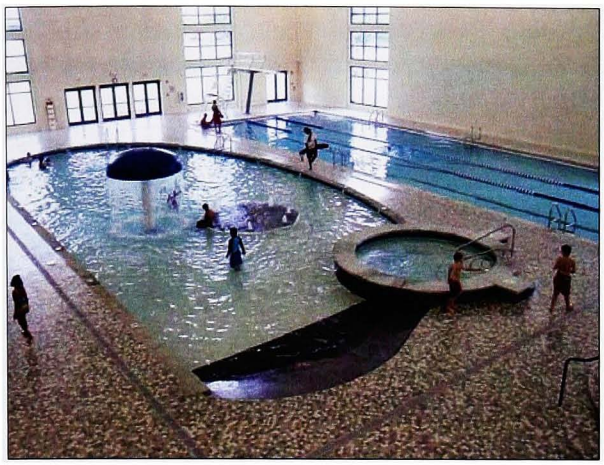

Figure 7.5 Smith Fitness Center at Fort Benning, Georgia.

Army Family and Morale, Welfare and Recreation Command, along with other sports and fitness experts, to develop the design criteria. Dedicated in June 2007, the 100,000-square-foot exercise facility included a two-story weight room and cardio theater, three-court gymnasium, lap pool, recreational pool, and women's weight room. The challenge, according to Clark, was to develop a modern state-of-the-art facility while incorporating Army requirements regarding force protection and energy conservation on a restricted budget. With expenditures for MILCON projects expected to increase, new standardized facilities will play a key role in lowering costs and streamlining building completion throughout the DOD.[31]

As a designated COS, the Huntsville Center has recently utilized a new 3-D technology, Building Information Modeling (BIM). The BIM contains mechanical, electrical, structural, and architectural components and can effectively integrate graphics features with database attributes. Initial trials of the BIM software reduced a project's design phase by 50 percent and eliminated many of the typical and unanticipated changes associated with the construction phase. With MILCON Transformation projects increasing during FY08–FY12, BIM technology will play an integral role in expediting designs for standardized projects.[32]

While many of Huntsville Center's more notable support programs involve the demolition, repair, or design of facilities, its support of furniture procurement has also provided a consistent workload. During this historical period, the Center continued to provide centralized management, procurement, and delivery of furnishings for new and renovated barracks for the Army. During FY06 alone, the ISCX Unaccompanied Personnel Housing procured 32,436 soldier living spaces, including 4,500 "critical replacement furnishing" spaces for returning soldiers. The year's efforts resulted in $14 million through programmatic contracting. "Our criteria of success," according Rakigjija, "is to purchase quality furnishings at competitive bulk prices, deliver, and install on the beneficial occupancy date."[33]

Importantly, the program has also developed standardized specifications for quality equipment. With new stationing requirements through BRAC, buildings and furniture both need to accommodate reconfigured missions and personnel assignments. While the furniture parameters do not dictate construction techniques, they do specify substrate, thickness of the backs and bottoms of drawers, edge-banding, and door construction. Standardizing furniture style also offers an easier adjustment period for soldiers transferring from one installation to the next. Specific qualifications also facilitate efficient procurement and delivery. In 2001, the General Services Administration (GSA) adopted Huntsville's Unaccompanied Personnel Housing (UPH) furniture standards for use on a Special Order Program contract.[34]

The success of the UPH program convinced the Office of the Assistant Chief of Staff for

Installation Management (OACSIM) to designate Huntsville as manager of the new Centrally Managed Administrative (CMA) Furniture program in FY06. The Installation Management Command funds Huntsville directly through the CMA program, instead of providing separate funding to each installation for acquisition. As with the UPH program, the Center facilitates standardization of furniture to "ensure the same quality of life is maintained" at various Army installations. The Center is also responsible for maintaining data collection and historical analysis to track the highest-quality product. During its first year of CMA management (FY07), the Center procured furniture for 177 buildings in addition to $2.4 million of barracks and administrative furnishings for Warriors in Transition.[35]

Installation Physical Security

Named the MCX for Electronic Security Systems (ESS) in 1983, the Huntsville Center continued to support installations and other government agencies with cradle-to-grave service for physical security during the late 1990s. From 1998 to 1999, the Center's ESS workload grew from a modest $8 million to $26 million, with the Smithsonian Institution representing its largest customer.[36] Since 2001, the Center's workload for ESS has included a variety of customers and a $390.5 million workload, most of which can be attributed to concerns over terrorism. Many of its customers are nonmilitary, such as the Bureau of Engraving and Printing, Bureau of Land Management, Centers for Disease Control, Kennedy Center for Performing Arts, and National Weather Service.

Following the terrorist attacks of 9/11, Headquarters, Department of the Army (HQDA) directed all U.S. Army installations to adopt closed-post security measures. Huntsville Center's experience with similar programs made it the logical conduit for new security funding. Because of 9/11, the Center established a new product line, the Access Control Points (ACP) program (Figure 7.6). Since its creation, ACP has evolved to include two subprograms. The Access Control Point Equipment Program (ACPEP) provides physical and electronic security equipment that

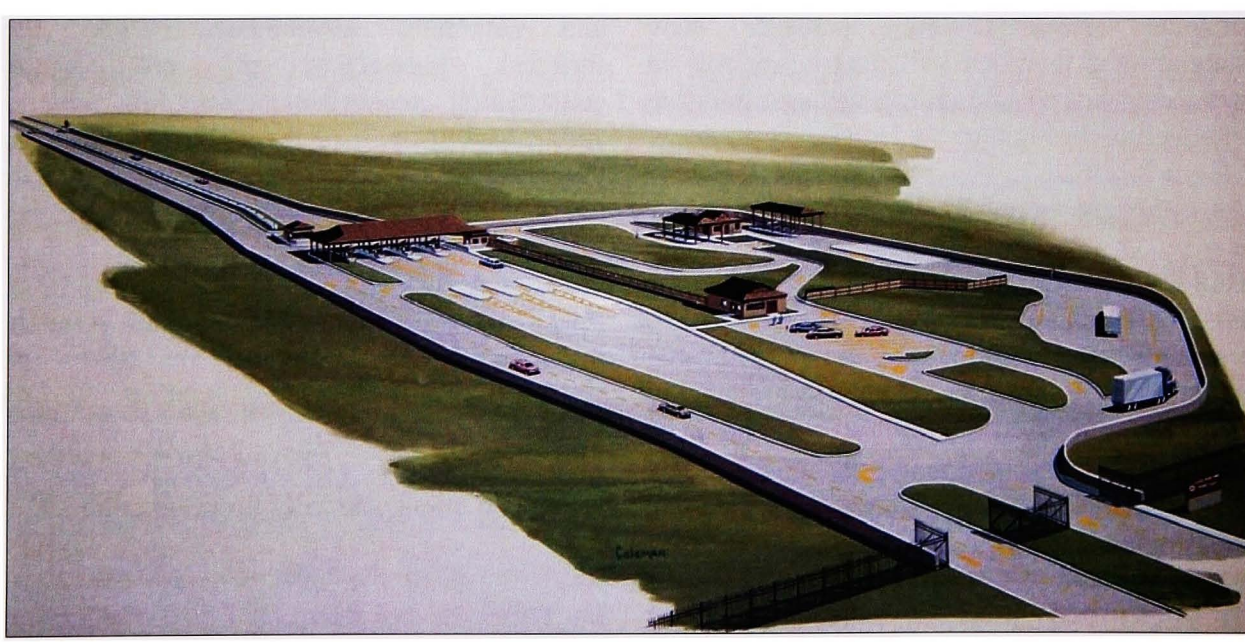

Figure 7.6 ACP rendering.

improves both gate and personnel security while reducing traffic congestion and maintaining access control according to Army standards. By 2004, the ACPEP program had evolved into a $360 million program for the ISCX. Further integrating security and efficiency, the Automated Installation Entry (AIE) program provides installation commander technology to automate vehicles onto an installation.[37]

Medical Programs Support

From 1998 to 2007, the Center continued its support of repair and renewal programs for medical operations. Among the programs was Medical Repair and Renewal (MRR), which Huntsville supported by providing contracting and technical support to military medical communities for design, repair, renovation, sustainment, restoration, and modernization of medical facilities. Customers included Army Medical Command (MEDCOM) facilities, U.S. Air Force Health Facility Office and medical facilities, Navy medical facilities, and the Department of Veterans Affairs. By the end of 2007, the MRR program included approximately 106 projects, with $432 million authorized under four IDIQ construction/ services contracts.

One notable example of the Center's MRR work is the rehabilitation of Walter Reed's Armed Forces Institute of Pathology (AFIP) in 2005. The $15 million project fully rehabilitated the previous building space and systems and created a modernized facility that ensured continuation of the AFIP mission for another 25 to 30 years. Also in 2005, the Center's MRR program aided in the $4.9 million medical clinic renovations of the U.S. Air Force's 314th Medical Group at Little Rock AFB.[38] The Center supported similar projects at other Air Force bases, including Keesler AFB in Biloxi, Mississippi, and Lackland AFB in San Antonio, Texas.

The number of casualties from the various theaters of operation of the GWOT strained the military's medical infrastructure. In July 2007, Walter Reed Medical Center contracted with the Huntsville Center to inquire about renovations for a "warrior transition clinic" for the treatment of injured soldiers returning to the United States. Walter Reed stipulated, however, that the work had to be completed by 1 October 2007. Robert Mackey, a project manager with the MRR program at Huntsville Center, noted, "We coordinated with Baltimore District to see if they wanted the project. Baltimore District was busy so we took it on." On 23 July, Huntsville Center personnel met with Walter Reed officials and negotiated the scope of work. The Center began the project on 1 August 2007 and completed the work by 29 September 2007. The project was part of an overall MRR and Integrated Modular Medical Support System (IMMSS) facelift project. Lieutenant Colonel Mary Cunico, the officer in charge of the Warrior Clinic at Walter Reed, stated that she was "very pleased with the outstanding support the Huntsville team provided to this very important project." [39]

The Operations and Maintenance Engineering Enhancement (OMEE) program is designed to provide operations and maintenance (O&M) services that support government medical and nonmedical facilities, including life-cycle support of equipment and safe and efficient equipment function. Services provided by the program include both scheduled and unscheduled maintenance, repair, and replacement of equipment and miscellaneous services such as aseptic management, biomedical equipment, infection control, pest management, and grounds maintenance. By the end of 2007, the Center's OMEE program carried out its mission through two large-

business and five small-business IDIQ contracts, with a total capacity of $375 million.

Finally, the Center continued to support the IMMSS. The IMMSS program provided design, installation, and reconfiguration of modular-systems furniture products to accommodate both technological advances and the functional requirements at Army medical facilities worldwide. In 2005, the Center awarded a sole-source IDIQ contract with a total capacity of $50 million. Between FY05 and FY07, the number of task orders on that contract grew from 68 to 164, with total expenditures increasing from $4.5 million to $16.9 million. Because of MILCON Transformation, the GWOT, and BRAC, the government's demand for modular medical equipment (Figure 7.7) is expected to increase between FY08 and FY12. Estimates include an anticipated $230 million for modular systems, $90 million for non-IMMSS furniture, and $350 million for medical equipment. By the end of 2007, Huntsville began looking to competitive acquisition for these product lines instead of sole-source IDIQ contracts.[40]

Figure 7.7 IMMSS equipment.

Medical Construction Support

During this historical period, the Huntsville Center also actively supported the construction and rehabilitation of the military's medical facilities. The Huntsville Center is the Corps of Engineers' Medical Facilities Center of Expertise (MX) and partners with USACE Regional Business Centers and Districts to provide expertise and the highest quality medical facility life-cycle support to the DOD, other federal agencies, and foreign governments. Huntsville Center also supports other medical facilities through the MRR program, which is part of the Installation Support and Programs Management Directorate.

Following the terrorist attacks of 9/11, with the large number of wounded personnel returning to the states from Operations IRAQI FREEDOM and ENDURING FREEDOM, the military and the Department of Veterans Affairs (VA) both faced an inadequate medical infrastructure. Additionally, the BRAC process resulted in new and different medical needs at several bases. Colonel John D. Rivenburgh (Ret.), former commander of the Huntsville Center, realized the importance of the medical mission when he stated that as part of the BRAC process, "Medical facilities will require upgrades and expansion to meet changing patient loads—medical repair and renewal."[41]

As with many other unique construction problems, the Army turned to the Huntsville Center to aid in managing the new construction and the rehabilitation of the medical facilities. Based on years of project-management expertise and teaming with skilled contractors, in 2005 HQUSACE appointed Huntsville Center the Medical Facilities Center of Standardization, part of Corps efforts that guided the construction of medical facilities in its 30-year history.

The Medical Facilities Mandatory Center of Expertise and Standardization developed working partnerships with USACE Regional Business Centers and districts to provide the other districts with expertise and quality medical facility life-cycle support during the construction or rehabilitation of medical facilities for the DOD, other federal agencies, and foreign governments. In addition to managing new construction, Huntsville Center's Project Management Directorate has been active in Medical Facility Repair, Non-DOD Medical Facility Repair, and Medical Facility Operation and Maintenance.[42]

The Medical Facilities Mandatory Center of Expertise

During the early 1970s, the U.S. Army underwent substantial institutional change with the elimination of the draft and the creation of an all-volunteer force. To make the military lifestyle more inviting, the military began transforming the spartan character of its barracks, post exchanges, recreational facilities, and other institutions to reflect the civilian world. For example, new post exchanges were designed to look like large retail stores.

In addition to the barracks and other buildings, in February 1976, the House Congressional Subcommittee on Military Installations investigated the cost of acquiring military health facilities, and subsequently ordered the DOD to study how to control the costs of providing military health-care facilities while providing high-quality health care. In August 1977, the DOD's study advocated the creation of an agency to handle the design of all medical facilities in the military recommended that USACE oversee that work. On 1 October 1978, the USACE created the Medical Facilities Design Office (MFDO), which oversees the design of medical facilities.[43]

In 1999, as part of a broader USACE reorganization, the Secretary of the Army moved the MFDO from USACE Headquarters and placed it under the command of Huntsville Center. The Army renamed the office the Medical Facilities Mandatory Center of Expertise. When the MX moved to Huntsville, it became a separate directorate, and the repair/renewal project managers (PMs) were moved into that directorate. While Huntsville had operational and administrative control, the office remained at Fort Belvoir, Virginia.

The Center's Medical MX program consisted of two main components. The new office would provide medical facilities expertise for the design and construction of DOD medical-funded work, and would develop USACE medical design and construction policies, technical guidance, procedures, criteria, specifications, and standards. Secondly, the USACE's plan called for the Center to assist with the management of medical construction and rehabilitation projects. This management plan was designed to assure that the projects would have an appropriate level of technical expertise through the concept, design, and construction phases. After the establishment of the new office, the MX took over many projects that were in development by the Huntsville Center. For FY01, medical projects accounted for 9 percent ($67 million) of the Center's planned obligations.[44]

In April 2005, the USACE expanded the Center's medical construction mission by appointing it the Corps' Center of Standardization for Medical Facilities. At that time, the Medical MX was renamed the Medical Facilities Mandatory Center of Expertise and Standardization. Brigadier General Merdith W. B. (Bo) Temple, Director of Military Programs, U.S. Army Corps of

Engineers, stated in a 2006 memorandum to all USACE Division and Center commanders that:

> The Medical Facilities Mandatory Center of Expertise, acting in partnership with the Project Delivery Team, has leadership responsibility for design acquisition strategy and concept design development, with continued technical oversight and direction during final design and construction execution concerning medically unique aspects of the project.[45]

In addition to the added responsibilities from the USACE, the Medical Facilities MX also faced changes in the administrative organization of the Huntsville Center. In July 2005, as part of the restructuring of the Huntsville Center, the medical project management team moved to the new PM Directorate with centers-of-expertise functions consolidated under the Engineering Directorate. The changes at the Huntsville Center reflected changes in the overall USACE organization.[46]

While much of the Center's medical work was MRR and rehabilitation projects, the MX specialized in the oversight of the construction of new hospitals. In September 2007, Norfolk District, U.S. Army Corps of Engineers, awarded a $649 million contract to build the new Fort Belvoir Community Hospital. Larry Delaney, chief of the Medical Facilities Mandatory Center of Expertise and Standardization, stated that the MX "was a key principal in the success of this project by participating in the selection of the Architect-Engineer joint venture team."[47] Early in the project, the MX team aided in the development of project-specific design criteria and technical requirements. The team also reviewed the detailed engineering technical reports and participated in on-board technical reviews. Additionally, MX staff aided in the development of the Request for Proposal documentation and served on the Source Selection Advisory Committee that selected the architect.[48]

Norfolk District and the MX utilized an innovative Integrated/Design/Bid/Build (IDBB) procurement for the construction of the Fort Belvoir Community Hospital project. The process called for the early addition of a construction contractor to the design team to increase constructability, provide accurate cost/schedule impacts of design decisions, and help improve design coordination. With this addition to the team, the process produced fewer design omissions and errors. Utilizing IDBB allowed the Corps to establish a construction contract earlier than would occur in the traditional process. This was critical to this project in order for it to meet the accelerated construction timelines dictated by BRAC.[49]

One of the MX's projects required design considerations for harsh environments. From 1998 to 2007, the MX worked with the Corps of Engineers, Alaska District, on several design and construction elements for the modern, $215 million Bassett Army Community Hospital at Fort Wainwright, Alaska (Figure 7.8). John Phillips, an electrical engineer with the MX, stated, "The role of MX was to develop and maintain the medical design criteria used on the project."[50] One of the major roles of the MX was in the design of the building's fire protection systems and internal communication systems. Because the hospital was located in an arctic climate, it utilized a drypipe sprinkler system. With that system, air pressure fills the pipes with water once the system is activated. In addition to designing the sprinklers to work in the cold climate, the engineers also had to develop special measures so that the exits were not blocked by accumulating snow.[51]

Figure 7.8 Bassett Army Community Hospital at Fort Wainwright, Alaska (U.S. Army photo).

The MX program highlighted the Center's ability to manage the design and construction of unique facilities. Using the Life Cycle Management Process, Huntsville Center personnel were able to aid various armed services in expanding medical services to their forces and dependents. In many cases, Huntsville Center personnel developed new management techniques to deal with short deadlines and adapted designs to accommodate harsh climates. Because of the growing numbers of veterans and the continued military operations in southwest Asia, the Center's MX mission has continued to grow in number of projects and funding.

APPENDIX ▪ *COMMANDER BIOGRAPHIES*

Colonel Walter J. Cunningham (1995–1999)

Colonel Walter J. Cunningham assumed command of Huntsville Division on 8 June 1995.

He holds a Bachelor of Science Degree in Civil Engineering from Mississippi State University and a Master's of Science Degree in Civil Engineering from the University of Illinois. He is a graduate of the Army Command and General Staff College and the Army War College. He holds the title of Professional Engineer, registered in Alaska. He is married to the former Phyllis Hope Crum of Corinth, Mississippi.

He served as program manager at the Construction Engineering Research Laboratory, Champaign, Illinois, and the initial project engineer for the construction of Ramon Air Base, Israel. In addition, he was Military Assistant to the Honorable Robert W. Page, former Assistant Secretary of the Army for Civil Works. Other assignments include member of the staff and faculty of the U.S. Army War College, Carlisle, Pennsylvania, and platoon leader and Company Commander in the 808th Engineer Battalion and Commander of the 47th Engineer Company at Fort Wainwright, Alaska. While assigned at Fort Wainwright, Cunningham also served as the Operations Officer for the Facility Engineer. He was the Battalion Operations Officer of the 588th Engineer Battalion in Fort Polk, Louisiana, served as the Chief of the Combat Support Division Readiness Group in Denver, Colorado, and commanded the 52nd Engineer Battalion at Fort Carson, Colorado.

Following a tour as Commander and District Engineer for the U.S. Army Corps of Engineers, Seattle District, Cunningham became Deputy Commander of U.S. Army Corps of Engineers, Huntsville Division, on 4 April 1994 with oversight of the Chemical Demilitarization program.

Colonel Harry L. Spear (1999–2002)

Colonel Harry L. Spear assumed command of the Huntsville Center on 11 August 1999.

He was commissioned in the Corps of Engineers in 1973. Colonel Spear previously commanded the Corps' Louisville District, where he oversaw both civil and military construction covering a five-state area. He was also assigned to the Mobile District Fort Rucker, Alabama, Area Office as a Project Engineer.

Colonel Spear's other military assignments cover a wide range of leadership responsibilities. His first assignment was as a platoon leader and company executive officer with the 249th Engineer Combat Battalion (H) in Germany. He commanded B Company, 3rd Battalion, Engineer Center Brigade, and was Battalion Executive Officer for the 1st Battalion Engineer Training Brigade. He served at Fort Campbell, Kentucky, with the 101st Airborne Division as the Operations Officer and Executive Officer of the 326th Engineer Battalion (AASLT). While assigned to Readiness Group Seneca, Seneca Army Depot, New York, he was the Engineer Advisor to Reserve Component Engineers throughout New York state. Colonel Spear served as the Brigade S-5, Civil Military Affairs Officer, with the 18th Engineer Brigade and was deployed to Iraq in support of Operation Provide Comfort. He commanded the 565th Engineer Battalion (CORPS) (BRIDGE) in Germany. He also served as the Engineer Branch Chief, Officer Personnel Management Directorate, U.S. Army Personnel Command.

A native of Macon, Georgia, Colonel Spear holds a bachelor of science degree in building construction from Auburn University and a master of science degree in engineering from the University of Washington. He is a graduate of the Command and General Staff College and the U.S. Army War College.

His military awards include the Distinguished Service Medal, the Legion of Merit, the Meritorious Service Medal with six oak-leaf clusters, the Army Commendation Medal with two oak-leaf clusters, the Army Achievement Medal with three oak-leaf clusters, the Southwest Asia Service Medal, the Humanitarian Service Medal, the Military Outstanding Volunteer Service Medal, the Parachutist Badge, and the Air Assault Badge.

Colonel John D. Rivenburgh (2002–2006)

Colonel Rivenburgh took command of the Huntsville Center on 1 August 2002. Before taking command in Huntsville, Alabama, he commanded the Huntington District in West Virginia for three years following a year of study at the Naval War College in Newport, Rhode Island.

Colonel Rivenburgh graduated from Clarkson College of Technology in 1976 and earned a master's degree in civil engineering from the University of Connecticut in 1986. He was commissioned through Clarkson College of Technology's Reserve Officer Training Corps in 1976. He is a graduate of the Army Command and General Staff College and the Naval War College and a Registered Professional Engineer in the State of Virginia.

Past assignments include Chief, Engineer Infrastructure Branch, Logistics and Security Assistance Directorate, U.S. European Command, Stuttgart, Germany. In June 1995 he assumed command of the 249th Engineer Battalion (Prime Power), Fort Belvoir, Virginia. During his tenure as commander, the battalion deployed to Bosnia as part of Operation Joint Endeavor and participated in relief operations in the wake of Hurricanes Marilyn, Fran, and Hortense in the U.S. Virgin Islands, North Carolina, and Puerto Rico.

Troop assignments include service as Platoon Leader, 2nd Engineer Battalion, Republic of Korea; Platoon Leader and Assistant Operations Officer, 39th Engineer Battalion, Fort Devens, Massachesetts; Assistant Division Engineer and Company Commander, 2nd Engineer Battalion, Republic of Korea; and Operations Officer and Executive Officer, 536th Engineer Battalion (Combat)(Heavy), Fort Kobbe, Panama.

Other assignments include Project Engineer, Waste Isolation Project Plant, Carlsbad Area Office, Albuquerque District, Carlsbad, New Mexico, Senior Team Leader and Chief, Roads and Airfield Branch, U.S. Army Engineer School; and Deputy Engineer, U.S. Army South and Chief, Engineer Plans and Operations, Third U.S. Army, Fort McPherson, Georgia.

His awards and decorations include the Defense Superior Service Medal, Meritorious Service Medal (sixth award), Army Commendation Medal (second award), Army Achievement Medal, National Defense Service Medal with bronze star device, Armed Forces Expeditionary Medal, Southwest Asia Service Medal with bronze star device, Armed Forces Service Medal, Humanitarian Service Medal (three awards), Overseas Service Medal (four awards), and the NATO Medal. He is a recipient of the Army Superior Unit Award (three awards) and the Joint Meritorious Unit Award (two awards). He is also a recipient of the Army Engineer Association's Bronze de Fleury Medal.

Colonel Larry D. McCallister (2006–2009)

On 21 July 2006, Colonel Larry D. McCallister assumed command of the U.S. Army Engineering and Support Center, Huntsville, Alabama, which has an annual $1.3 billion mission that focuses on worldwide national defense acquisition, engineering, design, construction, and planning programs. His previous assignment was commanding the Gulf Region Southern (GRS) District, U.S. Army Corps of Engineer in Iraq in support of Operation IRAQI FREEDOM. In that position, Colonel McCallister was responsible for a $2.5 billion Iraqi reconstruction program, overseeing more than 1,200 infrastructure construction projects that are bringing essential services and security to the people of Iraq.

Prior to his assignment in Iraq, Colonel McCallister was the Director/J4 and Command Engineer of the Logistics and Installations Directorate for U.S. Forces Japan at Yokota Air Base, Japan.

After graduating from college in 1978 as an ROTC Distinguished Military Graduate, Colonel McCallister was commissioned in the U.S. Army Corps of Engineers. He has held a variety of command and staff assignments worldwide, including Platoon Leader and Staff Officer, 293rd Engineer Battalion, 18th Engineer Brigade, Germany; Fort Worth District Project Engineer/Project Manager, Carswell Air Force Base, Texas; Staff Officer, 44th Engineer Battalion and Commander E Company, 2nd Engineer Battalion, 2nd Infantry Division, Korea; Assistant Professor, Mechanical and Civil Engineering Department, U.S. Military Academy, West Point, New York; Assistant Division Engineer and Executive Officer, 70th Engineer Battalion, 1st Infantry Division, Fort Riley, Kansas; Deputy Chief of Staff for Installations, Logistics, and Environment with the U.S. Army Space and Missile Defense Command, Huntsville, Alabama; and Commander/Area Engineer, The U.S. Engineer Group (TUSEG), Europe District, Incirlik Air Base, Turkey.

During Operation DESERT STORM, Colonel McCallister served as an Operations Officer in the 20th Engineer Brigade (Airborne), XVIII Airborne Corps. He has also deployed to Somalia during combat operations in Operation RESTORE HOPE as the Joint Task Force Engineer for JTF Somalia, and was the Base Engineer for Task Force Hawk (V Corps) in Albania, providing combat support of the Kosovo Air Campaign, Operation ALLIED FORCE.

In October 2000, Colonel McCallister moved to Tel Aviv, Israel, where he served as the Europe District's Israel Program Manager and Deputy District Engineer. He was responsible for the planning, programming, design, and construction management of the USACE implementation of more than $300 million in construction for the Israeli Military Facilities Relocation and Construction Program in accordance with the U.S.-brokered 1998 Middle East Peace Initiative, the Wye River Accords.

Colonel McCallister earned bachelor's and master's degrees in Civil Engineering from the University of Missouri at Rolla, a master's degree in Strategic Studies from the U.S. Army War College, and a doctorate in Civil Engineering from the University of Texas at Arlington. He is a graduate of the Army's Engineer Officer Basic and Advance Courses, the Combined Armed Services Staff School, the Army Command and General Staff College, the Army Management Staff College, and the Army War College. He is a registered Professional Engineer in Texas and Virginia, a Fellow with the Society of American Military Engineers, and

an inductee into the Academy of Civil Engineers from his alma mater in Missouri.

Colonel McCallister's awards and decorations include the Defense Superior Service Medal, Legion of Merit, Bronze Star Medal, Meritorious Service Medal (four), Joint Commendation Medal, Army Commendation Medal (four), Army Achievement Medal (three), Armed Forces Expeditionary Medal (two), United Nations Medal, NATO Medal, and numerous campaign and service medals. In 2000 he was selected as the USACE Military Engineer of the Year and one of the Top Ten Federal Engineers of the Year. He is also a recipient of the Army Engineer Association's Silver de Fleury Medal.

A Note on Sources

In conducting the archival research for this history, the Huntsville Center Public Affairs Office proved instrumental in gathering existing information, including files, briefings, news releases, fact sheets, and photographs. Unless noted in the text, all photographs were provided through the Public Affairs Office.

All interviews were recorded using a Maranz 670 digital voice recorder in .mpeg format. These interviews have been archived to CD and submitted to the U.S. Army Engineering and Support Center, Huntsville Public Affairs Office. Throughout our process of collecting archival material for this history, many of the interviewees also provided CDs or electronic copies of presentations, fact sheets, information bulletins, briefings, and articles.

List of Interviews

Raul E. Alonso	CEHNC-ED	30 July 2008
Sharon H. Butler	CEHNC-DB	6 June 2008
James M. Cox	USACE-Retired	29 July 2008
COL Walter J. Cunningham	USACE-Retired	5 May 2008
Charles Ford	CEHNC-ISPM	4 June 2008
Stan Lee	CEHNC-ISPM	4 June 2008
Brenda Hatley	CEHNC-OE	8 July 2008
Bill Johnson	CEHNC-CD	3 June 2008
Ronald R Lein	USACE-Retired	8 July 2008
COL Larry D. McCallister	USACE-Retired	5 June 2008
John D. Matthews	CEHNC-DC	8 May 2008; 20 April 2009
Betty Neff	CEHNC-MR	5 June 2008
Dr. John Potter	USACE-Retired	4 June 2008
Mirko Rakigjija	USACE-Retired	6 May 2008
Jim Reynolds	USACE-Retired	29 July 2008
COL John D. Rivenburgh	USACE-Retired	6 May 2008
Boyce Ross	CEHNC-ED	9 July 2008
Donna Rovere	USACE-Retired	5 May 2008
Bill Sargent	CEHNC-OE	7 May 2008
COL Harry L. Spear	USACE-Retired	5 May 2008
Dr. Mike Stovall	USACE-Retired	8 July 2008
Wes Turner	CEHNC-ISPM	28 July 2008

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[2] Stephen Ambrose, *Rise to Globalism: American Foreign Policy Since 1938* (New York: Penguin Books, 1991), 138; K. Lewis and K.J. Roxlau, "Historic Context of the Cold War from the Perspective of Air Power" in *A Systemic Study of Air Combat Command Cold War Material Culture* (Albuquerque, NM: Mariah Associates, Inc., 1995), 30-40; Russell Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (Bloomington: Indiana University Press, 1973), 403-404.

[3] Stephen P. Moeller, "Vigilant and Invincible," available at http://www.redstone.army.mil/history/missile/missiler.html. For a discussion of the SAFEGUARD system, see Richard B. Foster, *The Safeguard Ballistic Missile Defense Proposal and Arms Control Prospects for the 1970s* (Menlo Park, CA: Stanford Research Institute, 1969). Steven A. Hildreth, *Ballistic Missile Defense: Historical Overview,* Ft. Belvoir, VA: Defense Technical Information Center, 2007, http://handle.dtic.mil/100.2/ADA470214 provides an overview of the U.S. BMD program. Ernest J. Yanarella, *The Missile Defense Controversy: Strategy, Technology, and Politics, 1955-1972* (Lexington: University Press of Kentucky, 1977) presents an overview of the geopolitical aspects of the BMD question.

[4] For a discussion of the development of the U.S. Army missile program, and later the creation of the Marshall Space Flight Center in Huntsville, see Moeller, *Vigilant and Invincible,* and Andrew J. Dunar and Stephen P. Waring, *Power to Explore: A History of Marshall Space Flight Center, 1960-1990,* NASA Historical Series (Washington, D.C.: National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans, 1999).

[5] In the USACE, divisions are commanded by general officers and provide support for subordinate districts and centers of expertise. Operating divisions also serve as districts within their geographic area. Districts or operating divisions execute assigned USACE missions.

[6] D. Gregory Jeane, *A History of the Mobile District 1815 to 1985* (Mobile: U.S. Army Corps of Engineers, 2002), E. R. Bramlitt, *History of Canaveral District* (Atlanta: U.S. Army Corps of Engineers, 1971). Kitchens' *History of the Huntsville Division, 1967-1976* provides a comprehensive history of the development of BMD and the establishment of the Huntsville Division.

[7] Moeller, "Vigilant and Invincible."

[8] John C. Lonnquest, and David F. Winkler. *The Legacy of the United States Cold War Missile Program.* USA-CERL Special Report, N-97/01 (Department. of Defense, Legacy Resource Management Program, Cold War Project, 1996), 114-115.

[9] Lewis and Roxlau, "Historic Context," 40-43.

[10] Ambrose, *Rise to Globalism,* 245-248; W.G. Hyland, *The Cold War: Fifty Years of Conflict* (New York: Random House, 1991), 153-156, 161-162.

[11] "Safeguard Montana Complex (Malmstrom AFB)," The Stanley R. Mickelsen Safeguard Complex, http://www.srmsc.org/mnt0000.html Accessed 10 August 2009.

[12] Heidish, *1977-1981 Update*, 1-3.

[13] Heidish, *1977-1981 Update*, 4.

[14] Heidish, *1977-1981 Update*, 36.

[15] Torres, *1982-1987 Update*, 1.2.

[16] Heidish, *1977-1981 Update,* 22-25.

[17] Manders, *1992-1997 Update,* 4.

[18] Torres, *1982-1987 Update,* 1.3.

[19] Torres, *1982-1987 Update*, 1.4-1.5.

[20] Torres, *1982-1997 Update*, 4.1-4.4; Manders, *1988-1992 Update*, 34-36.

[21] Torres, *1982-1987 Update*, 4.1-4.8.

[22] HQUSACE established Life Cycle Project Management in July 1988. A Life Cycle Project Manager has overall "cradle to grave" responsibility for managing the planning, scoping, development, design, construction, and direction of important civil works/military.

[23] Torres, *1982-1987 Update*, 5.1-5.5; Manders, *1988-1992 Update*, 30-33; Manders, *1993-1997 Update*, 99.

[24] Janet A. McDonnell, *Supporting the Troops : The U.S. Army Corps of Engineers in the Persian Gulf War* (Alexandria, VA: Office of History, U.S. Army Corps of Engineers, 1996).

[25] Manders, *1988-1992 Update*, 2.

[26] For more information on KERO and post-war recovery efforts in Kuwait, see Janet McDonnell, *After Desert Storm: The U.S. Army and the Reconstruction of Kuwait.* (Washington, D.C.: Center of Military History, 1999). For information regarding the role of Huntsville Division during Desert Storm, see Manders, *1988-1992 Update*, 95-97.

[27] Manders, *1988-1992 Update*, 6, 15.

[28] Manders, *1993-1997 Update*, 25-26, 28.

[29] Manders, *1993-1997 Update*, 22-34.

[30] Interview with COL Harry L. Spear (Ret.) by Patricia Stallings, Huntsville, 5 May 2008.

Chapter 2 The Huntsville Center Matures

[1] The Transatlantic Programs Center was also a former division designated as a "Center" by HQUSACE in 1995. For more information on the Transatlantic Programs Center, see the TAC history fact sheets available at http://www.tac.usace.army.mil/Organization/tac_overview.html#Our_Rich_Heritage.

[2] Interview with COL John Cunningham (Ret.) and Donna Rovere by Patricia Stallings, Huntsville, 5 May 2008.

[3] For the Center's initial integration of ACOE, TQM, and APIC, see Manders, *1993-1997 Update*, 22-34.

[4] Manders, *1993-1997 Update*, 29-34. For information on the Army's adoption of TQM, see LTC Carole A. Briscoe, "Total Quality Management: A Strategic Process for Force XXI" (Carlisle Barracks, Pennsylvania: U.S. Army War College, 1996).

[5] See Manders, *1993-1997 Update,* 16-18; U.S. Army Engineering and Support Center, Huntsville, *Army Performance Improvement Criteria, 1999*, i.

[6] As defined by ER 1110-1-8158, *Corps-Wide Centers of Expertise Program* (January 1998) "An MCX is a USACE organization that has been approved by HQUSACE as having a unique or exceptional technical capability in a specialized subject area that is critical to other USACE commands." Centers of Expertise (CX) "are designated USACE organizations or individuals who have a demonstrated capability and expertise in a specialized area."

[7] Huntsville Center Briefings dated September 1998, October 2000, August 2005, on file at the Huntsville Center (HNC) Public Affairs Office (PAO); Jim Cox, "HNC Reorganization Plan," *Huntsville Center Bulletin* (June 2005), 8.

[8] Debra Valine, "Huntsville Center Prepares for New Overall Reorganization," *Huntsville Center Bulletin* (April 2007), 1, 12-13; Huntsville Center Briefings dated February 2007 and October 2007, on file at the Huntsville Center PAO. Interview with COL Larry D. McCallister (Ret.) by Patricia Stallings, Huntsville, 5 May 2008. Also, Huntsville Center Fact Sheet, "EM-CX Areas of Expertise, March 2009," on file at the Huntsville Center PAO.

[9] U.S. Army Engineering and Support Center, Huntsville, "President's Quality Award Nomination Form, 2002," provided by Betty Neff, Huntsville Center. Also, Cunningham and Rovere interview. U.S. Army Engineering and Support Center Huntsville, "Army Performance Improvement Criteria, Nomination Form," 2000.

[10] "Corps of Engineers Receives President's Quality Award," HNC Press Release #01-08, 25 September 2001; HNC Press Release 22 April 1998, on file at the Huntsville Center PAO. Also, Anna D. Gowans Miller, "Statement of Process Improvements and Related Benefits Generated by the PQA Initiative of the U.S. Army Engineering and Support Center, Huntsville, Alabama, from FY 1995 to FY 2000,"10.

[11] Betty Neff, "Scorecard Measures Huntsville Center's Financial Performance," *Engineer Update* (October 2000), available at http://www.hq.usace.army.mil/cepa/pubs/oct00/story16.htm. Huntsville Center Briefing "April 2001 Monthly Business Meeting," on file at the Huntsville Center PAO. Also, U.S. Army Engineering and Support Center, Huntsville, "President's Quality Award Nomination Form, 2002," provided by Betty Neff, Huntsville Center, hereafter cited as Huntsville Center PQA 2002; Gowans Miller, "Statement of Process Improvements," 2; Huntsville Center Briefing, "Monthly Business Meeting, October 2007," on file at the Huntsville Center PAO.

[12] Spear interview; Interview of Jim Cox by Patricia Stallings, Huntsville, 28 July 2008; Cunningham Rovere interview. The Army Environmental Center became the Army Environmental Command in an October 2006 reorganization. For further details, see Chapter 7.

[13] U.S. Army Engineering and Support Center, Huntsville, *Army Performance Improvement Criteria, 1999*: iv. External customer satisfaction survey question material provided by Huntsville Center Quality Manager Betty Neff.

[14] See Huntsville Center PQA 2002; Sandra McAnally, "2001 External Customer Survey Results," *Huntsville Center Bulletin* (October 2001),1; Huntsville Customer Satisfaction Data provided by Betty Neff.

[15] Interview of COL John Rivenburgh (Ret.) by Patricia Stallings, Huntsville, 6 May 2008; Lt. COL James S. Weller, "ISO 9000—A Tool for the U.S. Army Corps of Engineers" (Carlisle Barracks, PA: U.S. Army War College, 1997), 1-5.

[16] Interview of Dr. Mike Stovall by Patricia Stallings, Huntsville, 8 July 2008; Betty Neff, "Center Completes Training for International Standards," *Huntsville Center Bulletin* (July 2004), 5; Kim Gillespie, "Pyramid Pictures Quality Management Program," *Huntsville Center Bulletin*

(July 2005), 3; ISO 9000 Briefing dated 18 February 2008, provided by Betty Neff; Rivenburgh interview.

[17] COL Linda R. Herbert, "Lean Six Sigma Challenges and Opportunities" (Carlisle Barracks, PA: U.S. Army War College, 2008); also John Reese, "Army Adopting Lean Six Sigma," *Army News Service*, 8 February 2006; "Contracting to Implement Increased Productivity Process," *Huntsville Center Bulletin* (February 2004), 8.

[18] Interview of Betty Neff by Patricia Stallings, Huntsville, 5 June 2008; Huntsville Center Press Release #07-17, 7 May 2007; Chris Gardner, "Huntsville Center Officially ISO Certified," *Huntsville Center Bulletin* (May 2007), 5.

[19] Almost every employee interviewed remembered the late 1990s as a period when other Corps organizations falsely accused the Center of "poaching" work. According to Ford, "We were accused of poaching all the time. You couldn't walk outside the door without somebody saying 'you're in my territory.'" The accusation dates back to the previous historical period as well; see Manders, *Historical Update, 1993-1997*, 20. Interview of Charles Ford and Stan Lee by Patricia Stallings, Huntsville, 6 July 2008.

[20] Interview of Mirko Rakigjija by Patricia Stallings, Huntsville, 6 May 2008; Ford and Lee interview.

[21] Rivenburgh interview; McCallister interview.

[22] Interview with Brenda Hatley by Patricia Stallings, Huntsville, 8 July 2008. Ford and Lee interview.

[23] COL John Cunningham (Ret), "Briefing to the Society of American Military Engineers," 2 September 1998, on file at the Huntsville Center PAO. Also, COL Larry D. McCallister, "Command Briefing: U.S. Army Engineering and Support Center," 18 October 2007, on file at the Huntsville Center PAO.

[24] Ford and Lee interview.

[25] These numbers represent local Huntsville staff only and do not include personnel assigned as resident engineers at Chemical Demilitarization facilities, those stationed in Alexandria as part of the Medical Center of Expertise, or staff assigned to the CEA/CMC program in Operation Iraqi Freedom. See U.S. Army Engineering and Support Center, Huntsville, "President's Quality Award Nomination Form, 2002," provided by Betty Neff, Huntsville Center, and COL Larry D. McCallister, "Command Briefing: U.S. Army Engineering and Support Center," 18 October 2007, Huntsville Center PAO.

[26] Spear interview.

[27] For more information on Federal and Corps workforce issues, see U.S. Government Accountability Office, *Human Capital: Corps of Engineers Needs to Update Its Workforce Planning Process to More Effectively Address Its Current and Future Workforce Needs* (GAO-08-596), May 2008. See also U.S. Government Accountability Office, *Human Capital: Federal Workforce Challenges in the 21st Century* (GAO-07-556T), 6 March 2007.

[28] Interview of Ron Lein by Patricia Stallings, Huntsville, 8 July 2008; McCallister interview.

[29] Interview of Boyce Ross by Patricia Stallings, Huntsville, 9 July 2008.

[30] Lein interview.

[31] The Civil Service Reform Act of 1978 (PL 95-454) established the Senior Executive Service to provide a qualified corps of executive leadership in non-Presidential appointment positions. Cunningham and Rovere interview; Cox interview. Also Bob DiMichele, "Off-Site Meeting Discusses Leadership Issues," *Huntsville Center Bulletin* (January 2000):1-2; Rivenburgh interview.

[32] U.S. Army Engineering and Support Center, Huntsville, "Army Performance Improvement Criteria, 1999," v; Cunningham and Rovere interview; McCallister interview.

[33] Appendix A contains complete biographies for each commander.

[34] Spear interview.

[35] Rivenburgh interview; McCallister interview.

Chapter 3 The Huntsville Center and the Chemical Demilitarization Mission

[1] See Damon Manders, *Historical Update, 1993-1997*, 49-64, for a discussion of the Center's previous work in chemical demilitarization. Also, Interview of Jim Cox by Patricia Stallings, Huntsville, 29 July 2009.

[2] COL Walter J. Cunningham, "Briefing: Huntsville Center Overview, September 2, 1998." On file at the Huntsville Center PAO.

[3] Though the practices have changed over the decades, they were always in keeping with the practices of industry at the time. Reid Kirby, "Chemical Demilitarization: Public Policy Aspects," *CML Army Chemical Review* (April 2004), 46.

[4] Andrew Newman, "Arms Control, Proliferation and Terrorism: The Bush Administration's Post-September 11 Security Strategy," *Journal of Strategic Studies* 27, no. 1 (2004), 59-88.

[5] John P. Sinnott, "It Was Algerian and Canadian Soldiers at Ypres Who Suffered History's First Poison Gas Attack," *Military History* 11, no. 1 (1994), 12. The first use of poisonous gas was by German troops at the second battle of Ypres, Belgium, on 22 April 1915, after having experimented with tear gas and sneezing powder at the beginning of the war. The poisonous fumes decimated Algerian and Canadian troops; see also Maurice Matloff, ed., *American Military History* (Washington DC: Office of the Chief of Military History, 1969), 363, 408. The U.S. Army has a long history in chemical demilitarization, dating back to the activities of the Chemical Warfare Service in World War I. For a history of the Chemical Weapons Corps, see Al Mauroni, "The U.S. Army Chemical Corps: Past, Present and Future," *On Point: Journal of Army History* 9, no. 3 (2004), 9-14. There has been some historical discussion on the use of chemical and biological weapons by the Imperial Japanese military. However, those experiments did not occur on the battlefield. See Roger B. Jeans, "Alarm in Washington: A Wartime 'Expose' of Japan's Biological Warfare Program," *Journal of Military History* 71, no. 2 (2007), 411-439.

[6] Conrad C. Crane, "'No Practical Capabilities': American Biological and Chemical Warfare Programs during the Korean War," *Perspectives in Biology and Medicine* 45, no. 2 (2002), 241-249.

[7] Matloff, ed., *American Military History,* 541.

[8] Manders,*Historical Update, 1993-1997,*, 48-49.

[9] Ibid.

[10] Heidish, *1977-1981 Update*, 32.

[11] The stockpile was aging and had grown during the Reagan administration. Reagan decided in 1985 to resume production of chemical weapons after a 16-year moratorium to use as a negotiating tool with the Soviet Union. Timothy Devine, "The U.S. Decision to Produce Chemical Weapons," *Fletcher Forum of World Affairs* 14, no. 2 (1990), 372-393.

[12] The signing of the convention occurred in January 1993; therefore, there was no longer a Soviet Union, and the new Russian Republic has responsibility for most of the chemical weapons.

[13] Harold P. Smith Jr., "Funding CW Demilitarization in Russia: Time to Share the Burden," *Arms Control Today.* (November-December 1998), 16-21. There was debate among governmental officials on the idea of arms control and chemical weapons. See Lewis A. Dunn, "Chemical Weapons Arms Control: Hard Choices for the Bush Administration," *Survival* 31, no. 3 (1989), 209-224; Charles C. Flowerree, "The Politics of Arms Control Treaties: A Case Study," *Journal of International Affairs* 37, no. 2 (1984), 269-282; J. P. Perry Robinson, "Disarmament and Other Options For Western Policy-Making On Chemical Warfare," *International Affairs* 63, no. 1 (1986), 64-80.

[14] COL Walter J. Cunningham, Briefing: "Huntsville Center Overview 9 April 1999." On file at the Huntsville Center PAO.

[15] Briefing for LTG Carl A. Strock, Chief of Engineers and Commander, U.S. Army Corps of Engineers, U.S. Army Engineering and Support Center, June 2006. On file at the Huntsville Center PAO.

[16] Torres, *A History of Huntsville Division, U.S. Army Corps of Engineers 1982-1987 Update* (1990), 4-4.

[17] COL Walter J. Cunningham, "Huntsville Center Briefing for the Society of American Military Engineers," 2 September 1998. On file at the Huntsville Center PAO.

[18] Department of the Army, FY 2001 Budget Estimates, Submitted to Congress, February 2000. Chemical Agents and Munitions Destruction, Army, 56.

[19] "Chemical Weapons: Sustained Leadership, Along With Key Strategic Management Tools, Is Needed to Guide DOD's Destruction Program," *General Accounting Office Reports & Testimony* (October 2003).

[20] Ibid.

[21] "Army creates new chemical materials agency," *Army Logistician* 35.3 (May-June 2003), 43; "Chemical demilitarization program a mess but problems unlikely to be addressed," *Hazardous Waste Superfund Week* 25.47 (1 December 2003), 463; "Chemical Weapons: Better Management Tools Needed to Guide DOD's Stockpile Destruction Program," *General Accounting Office Reports & Testimony,* GAO-04-221T (December 2003).

[22] Chemical Demilitarization Fact Sheet, 2007. On file at the Huntsville Center PAO.

[23] COL Walter J. Cunningham, "Huntsville Center Briefing for the Society of American Military Engineers," 2 September 1998; COL Walter J. Cunningham, Briefing: "Huntsville Center Overview," 9 April 1999. COL Larry D. McCallister, Briefing "Huntsville Center Overview" dated 18 October 2007. Presentations are on file at the Huntsville Center PAO.

[24] "Chemical Demilitarization Progresses," *Army Logistician* (May-June 2005). Available at http://www.almc.army.mil/alog/issues/MayJun05/pdf/alog_may_jun_05.pdf.

[25] "Chemical Materials Agency eliminates half of munitions in stockpile," *Huntsville Center Bulletin* 27 (October 2006), 4.

[26] Manders, *Historical Update, 1993-1997*, 51.

[27] As a "sunset" construction organization, the Center would no longer have a construction role once the mission is complete.

[28] "Destruction Technologies," http://www.opcw.org/our-work/demilitarisation/destruction-technologies/.

[29] "Chemical demilitarization progresses," *Army Logistician* 37.3 (May-June 2005), 42.

[30] Ibid., 56

[31] "Meet the PM," *Huntsville Center Bulletin* (January-February 1998): 5, 8.

[32] Kim Gillespie, "Completion ceremony held for Anniston Chemical Agent Disposal Facility," *Huntsville Center Bulletin* (June 2001), 1.

[33] "Crews Destroy Last VX Mine; nerve agent to be burned tonight," *The Anniston Star*, 24 December 2008.

[34] Cunningham, "Huntsville Center Briefing: Society of American Military Engineers," 2 September 1998.

[35] Kim Gillespie, "Umatilla Chemical Agent Disposal Facility Completed" *Huntsville Center Bulletin* (August 2001), 3.

[36] Factsheet: "Umatilla Chemical Agent Facility," 21 May 2008.

[37] Cunningham, "Briefing: Society of American Military Engineers."

[38] Jean Pavlov, "Pine Bluff Chemical Demilitarization Facility Construction Is Completed," *Huntsville Center Bulletin* (February 2003), 1, 8.

[39] "Army completes binary chemical treatment," U.S. Army CMA News Release, 12 October 2006, NSCMP #06-11. Available at http://www.cma.army.mil/fndocumentviewer.aspx?docid=003676115.

[40] "Destruction Technologies," http://www.opcw.org/our-work/demilitarisation/destruction-technologies/.

[41] "The U.S. Army Chemical Materials Agency (CMA)—Edgewood, MD," available at http://www.cma.army.mil/edgewood.aspx;
http://www.hnd.usace.army.mil/chemde/Prog_Proj2wPict.aspx.

[42] "Morrison Knudsen Wins Construction-Support Contract at Chemical Demilitarization Plant in Indiana," *PR Newswire* (17 March 1999), 7272. See also Newport Chemical Depot, 2007 Brochure.

[43] Ibid.

[44] Ibid.

[45] Deb Kelly, "VX neutralization process end raises questions about future for Newport Chemical Depot, 1,000 workers," [Terre Haute] *Tribune Star,* 21 July 2008.

[46] "Chemical Demilitarization Marks Milestone," *Engineer Update* (2009). Available at http://www.usace.army.mil/CEPA/EUOld/Pages/0901ChemDemil.aspx. Accessed on 21 August 2009

[47] Walter J. Cunningham, Briefing: "Huntsville Center Overview," 9 April 1999. On file at the Huntsville Center PAO.

[48] Assembled Chemical Weapons Alternatives Program factsheet, available at http://www.pmacwa.army.mil/ip/dl/acwa_overview_12June08.pdf.

[49] "Destruction Technologies," http://www.opcw.org/our-work/demilitarisation/destruction-technologies/.

[50] Ibid.

[51] Department of the Army, FY 2001 Budget Estimates, Submitted to Congress, February 2000. Chemical Agents and Munitions Destruction, Army, 11-12; "ACWA Blue Grass Chemical Weapons Disposal," *Assembled Chemical Weapons Assessment Program,* United States Department of Defense, 2006-07-25, http://www.pmacwa.army.mil/ky/cw_disposal_ky.htm.

[52] It did not meet the 2007 deadline for the destruction of the chemical weapons.

[53] Kerry Boyd, "Budget office calls chem-demil 'ineffective' (News and Negotiations)," *Arms Control Today* 33.2 (March 2003), 23.

[54] "Study: Weapon destruction plan in turmoil," *Waste News* 9.10 (15 September 2003), 4.

[55] With a new emphasis placed on disposal of weapons after 9/11 and Congressional mandates to use new technologies, CMA estimated that it would need $150 to $200 million per site to complete the accelerated schedule established in the past to meet the 2012 deadline. These amounts could not be accommodated within the FY05 or FY06 budgets. For more information on funding for CMA, see Michael Nguyen, "U.S. chemical demilitarization stalls," *Arms Control Today* 35.2 (March 2005), 41-42.

[56] "Directorate of Chemical Demilitarization Programs/ Projects," available at http://www.hnd.usace.army.mil/chemde/Prog_Proj2wPict.aspx.

[57] Kim Gillespie, "Work on chem-demil facility in Colorado continues on pace," *Huntsville Center Bulletin* 28 (April 2007), 1, 14.

[58] "USA: Bechtel Parsons Blue Grass Awarded Contract to Construct Pilot Test Facility," *Asia Africa Intelligence Wire* (19 June 2003); Kim Gillespie, "Blue Grass Chemical Agent Destruction Pilot Plant Supports Corps' Campaign Goals," *Huntsville Center Bulletin* (March 2007), 15.

[59] Gillespie, "Blue Grass," 14.

[60] "Chemical demilitarization program reaches milestones," *Army Logistician* 39.6 (Nov-Dec 2007): 50.

[61] Manders, *Historical Update, 1993-1997*, 58.

[62] 22 U.S.C. ch.68a—Cooperative Threat Reduction with States of Former Soviet Union.

[63] "Directorate of Chemical Demilitarization Programs/ Projects," available at http://www.hnd.usace.army.mil/chemde/Prog_Proj2wPict.aspx#Current Programs/Projects.

[64] "Russian Chem Demil Role Expands," *Huntsville Center Bulletin* (December 1998) 1, 3.

[65] Cunningham, "Huntsville Center Overview," 9 April 1999. On file at the Huntsville Center PAO.

[66] "US offers help in demilitarization of Russian chemical plant," *ITAR/TASS News Agency* (29 April 1999): 1008119t0076.

[67] Art Davies, "Central Chemical Weapons Destruction Analytical Laboratory Awards," *Huntsville Center Bulletin* (April 2003), 2.

[68] Ibid.

[69] Kerry Boyd, "Deadlines extended for Russian chemical demilitarization (News and Negotiations)," *Arms Control Today* 32.9 (November 2002), 25.

[70] Cunningham, "Huntsville Center Overview," 9 April 1999.

[71] COL John D. Rivenburgh, "Breaking Ground in Russia," *Army Magazine* (June 2006), 43.

[72] Ibid., 44.

[73] Ibid.

[74] George Ward, "Huntsville is Key Element in Russia's Chemical Weapons Disposal Facility," *Huntsville Center Bulletin* (April 2002), 4.

[75] Rivenburgh, "Breaking Ground," 46.

[76] Ibid.

[77] "For a Job Safely Done," *Huntsville Center Bulletin* (November 2005), 11.

[78] Seth Brugger, "U.S. reinstates funds for Russian chemical demilitarization. (News and Negotiations)," *Arms Control Today* 32.1 (Jan-Feb 2002), 35.

[79] "Chemical Weapon Destruction Underfunded Warns Russian Official," BBC Worldwide Monitoring, 12 February 2004; Justin Bernier, "The Death of Disarmament in Russia?" *Parameters*, Summer 2004.

[80] Christine Kucia, "CTR programs get boost with budget request (News and Negotiations)," *Arms Control Today* 33.2 (March 2003), 27.

[81] Jo Anita Miley, "Outings great fun for Russian orphans, Corps employees," *Huntsville Center Bulletin* (April 2006), 5.

[82] "Meet the PM," *Huntsville Center Bulletin* (March-April 1998): 7.

Chapter 4 Old Munitions and New Strategies

[1] For overviews of the Center's associations with DERP/FUDS ordnance and explosives removal, see Manders, *1988-1992 Historical Update*, 34-45, and Manders, *1993-1997 Update*, 75-90. For a discussion of the Center's reorganization efforts under COL Cunningham, see Chapter 2.

[2] U.S. Army Engineering and Support Center, "Understanding the FUDS OE PAE/SI," undated.

[3] Defense sites are defined as "locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense," and do not include operational ranges, storage, and manufacturing facilities used for treatment or disposal of munitions, of which most sites were covered under the Installation Restoration Program of DERP. For MMRP, the defense sites included all active, BRAC, excess property, FUDS, and National Guard Bureau installations. For additional information on the MMRP of DERP, see *DERP Annual Report to Congress, FY02,* available at http://deparc.xservices.com/do/home. Also Mark Albe and Margaret Schnebly, "Military Munitions Response Program," *Engineer: The Professional Bulletin of Army Engineers* (October-December 2004): 19-21.

[4] As defined by the DOD, Munitions and Explosives of Concern are classified as those munitions that pose an explosive safety risk including both unexploded ordnance and discarded military munitions. Munitions Constituents are defined as any explosive and nonexplosive materials originating from unexploded ordnance or discarded military munitions.

[5] MAJ GEN Merdith W.B. (Bo) Temple, "Environmental Transformation," *Public Works Digest* (May/June 2008): 3-4.

[6] In October 2006, the Army consolidated three entities—the Installation Management Agency (IMA), the Community and Family Support Center (CFSC), and the Army Environmental Center–under a three-star command, called the Installation Management Command (IMCOM). Under this reorganization, IMCOM's Commanding General also serves as the Assistant Chief of Staff for Installation Management (ACSIM). It was at this time that the Army Environmental Center was re-designated as the Army Environmental Command.

[7] For more information on RACER, see Jim Peterson and Kate Peterson, "RACER Takes Ordnance Projects to Cost Efficient Finish Line," *Corps Environment* (October-December 2000): 11.

[8] In 1996, HQUSACE considered a similar reorganization that would decentralize the Center's ordnance design and execution responsibilities to other Corps districts. However, anticipated workload increases never materialized, and Headquarters postponed the efforts (see Manders, *1993-1997 Update*, 77-78). Importantly, the MM-CX also trained and mentored the Baltimore, Omaha, and Sacramento districts, which were eventually designated MMRP Design Centers during this time period. Pat Rivers, "Huntsville Center 'Franchises' OE Work to Districts," *The Corps Environment* (January-March 2001), 3. Also, interview of Dr. John Potter by Patricia Stallings, Huntsville, 4 June 2008.

[9] MAJ GEN Merdith W.B. (Bo) Temple, "Environmental Transformation," *Public Works Digest* (May/June 2008), 3-4. Also Andrea Takash, "Corps Strategy Addresses Military Munitions Across the Globe," *Public Works Digest* (May/June 2007), 17-18. See also U.S. General Accounting Office, *Military Munitions: DOD Needs to Develop a Comprehensive Approach for Cleaning Up Contaminated Sites* (GAO-04-147), 19 December 2003.

[10] Candice Walters, "Corps Makes It Easier to Get Environmental Cleanup Help," *Public Works Digest* (November/December 2007), 19-20. See also *Huntsville Bulletin* (October 2007), 6; HNC News Release #08-08, 25 April 2008.

[11] Potter interview; also Kim Gillespie, "Krohn Offers Another 'Tool' for OE Removals," *The Corps Environment* (January-March 2001), 1.

[12] Kim Gillespie, "Robotic Ordnance Removal Operation Used at Former Camp Croft," *The Corps Environment* (April-June 2001), 13.

[13] Jean Pavlov, "Blast, Fragment Mitigation Demo Conducted at Fort Ord," *The Corps Environment* (September 2001), 8.

[14] Kim Gillespie, "Innovative Technology Improves Project Efficiency," *The Corps Environment* (October/December 2000), 14.

[15] Joseph M. Serena III, *Mapping Explosive Safety Hazards (MESH) in a GIS Environment: A Program Update*, U.S. Army Engineering and Support Center, Huntsville, 1999.

[16] Janet Simms and Larry Carin, U.S. Army Engineering and Support Center, *Innovative Navigation Systems to Support Digital Geophysical Mapping, ESTCP #200129,* prepared for the U.S. Army Engineer, Research and Development Center, Vicksburg, 25 September 2004. See also Scott Millhouse, "Technology Integration Key to Progress, Improvement of OE Work," *The Corps Environment* (January-March 2001), 11.

[17] U.S. Army Engineer Research and Development Center, "ERDC UXO Team Initiates New Active Range Program," ERDC News Release, 12 September 2006.

[18] Jo Anita Miley, "Huntsville Center and Mobile District Combine Efforts to Clean Up Camp Sibert," *Huntsville Center Bulletin* (July 2006), 1,10. See also Kim Craft, "Sibert Ranks First Nationally in Weapons, Security Risk," *Gadsden Times*, 22 August 2005.

[19] Andrea Takash, "Innovative Technologies Provide Vivid Details of Buried Metals," *Huntsville Center Bulletin* (June 2007), 4, 11.

[20] *Final Environmental Impact Statement: Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawaii: Volume 1.* Prepared for the Department of the Army, Office of the Secretary of the Army, Washington, D.C. and the U.S. Army Corps of Engineers, Honolulu Engineer District, Fort Shafter, Hawaii. Prepared by Tetra Tech, Inc., Honolulu, Hawaii, May 2004. For more information on the Stryker Brigade Combat Teams, see Mark J. Reardon and Jeffery A. Charlston, *From Transformation to Combat: The First Stryker Brigade at War* (Washington, D.C. Center of Military History, 2007).

[21] Charles L. Twing and Kimberly K. Meacham, "Chemical Munitions Encountered on the Schofield Barracks Training Facility." Paper presented at the International Chemical Weapons Demilitarization Conference, 17 May 2006. See also, Kim Gillespie, "Munitions Mission Proves Huntsville Center Critical to Supporting Warfighter," *Huntsville Center Bulletin* (September 2006), 7, 11.

[22] Twing and Meacham, "Chemical Munitions," 6-7; also Gillespie, "Munitions Mission," 7, 11.

[23] Charles L. Twing, "Huntsville Center Provides Donovan Chamber to Clean Up Leftover World War I Explosives in Belgium," *The Corps Environment* (July 2002), 4. See also Herbert C. DeBisschop and Timothy A. Blades, *Destruction of Chemical Munitions: Evaluation of the Donovan Contained Detonation Chamber (CDC), PoelKapelle, Belgium,* prepared by the Edgewood Chemical Biological Center, U.S. Army Soldier and Biological Chemical Command, Aberdeen Proving Ground, Maryland, July 2002.

[24] A 1986 amendment of the CERCLA authorized both DERP and the cleanup of FUDS. The amended legislation also included provisions for increased public involvement and required the

Department of Defense to maintain an administrative record of remediation projects. By 1993, the DOD also required that installations closed under BRAC had to establish Restoration Advisory Boards (RAB) with the stakeholders, including both the local community and any governmental agencies. Potter interview. Also, interview of Bill Sargent by Patricia Stallings, Huntsville, 6 May 2008. Originally drafted in 1999, EP-1110-3-8 was revised in April 2004. The document is available online at http://140.194.76.129/publications/eng-pamphlets/ep1110-3-8/toc.htm. See also Chris Gardner, "Corps Discusses FUDS and Public Involvement at Conference," *Corps Environment* (June 2007).

[25] U.S. Army Engineering and Support Center, *Interim Guidance: Ordnance and Explosives Risk Impact Assessment*, undated.

[26] First published in 2000, *The Corps Environment* combined two previous newsletters, *The Restoration Reporter* and *Ordnance and Explosives Environment.*

[27] Kim Gillespie, "San Diego City Schools Produce Ordnance Awareness Video," *The Corps Environment* (April/June 2001), 7.

[28] Kim Gillespie, "Military Munitions Center of Expertise Receives Environmental Design Team of the Year Award," *Huntsville Center Bulletin* (January 2007), 12; Becky Proaps, "Huntsville Center Employees Recognized with Special Environmental Cleanup Awards," *Huntsville Center Bulletin* (March 2006), 3.

Chapter 5 In Support of Operation Iraqi Freedom

[1] Richard W. Stewart, *American Military History, Volume II: The United Sates Army in a Global Era, 1917-2003* (Washington, D.C.: Center of Military History, 2005), 459-476.

[2] The Combat Studies Institute has prepared two in-depth analyses of Operation Iraqi Freedom, including the initial combat operations and the ensuing reconstruction process. See COL Gregory Fontenot, LTC E.J. Degen, and LTC David Tohn, *On Point: The United States Army in Operation Iraqi Freedom* (Fort Leavenworth, KS: Combat Studies Institute, 2004); Dr. Donald P. Wright and COL Timothy R. Reese, *The United States Army in Operation Iraqi Freedom, May 2003-January 2005, On Point II: Transition to the New Campaign* (Fort Leavenworth, KS: Combat Studies Institute Press, 2008).

[3] In 2005, the U.S. Army Engineering and Support Center sponsored Paul L. Miller's *A History of CJTF-7 and CEA Coalition Munitions Clearance Program: Operation Iraqi Freedom Phase IV Post-Combat Operations Captured Enemy Ammunition, August 2003-December 2004* (hereafter cited as *CJTF-7*). This history was not formally published through the USACE, but a draft is on file at the Huntsville Center Public Affairs Office. For additional general program information, see COL George Zahaczewsky, "Destroying the Mother of All Arsenals: Captured Enemy Ammunition Operations in Iraq," *Journal of Mine Action* (February 2006), unpaginated. Available at http://maic.jmu.edu/journal/9.2/focus/zahaczewsky/zahaczewsky.htm; U.S. Army

Engineering and Support Center, *Iraq Coalition Munitions Clearance Report to Congress–Unclassified* (May 2005). In 2008, Brockington and Associates, Inc., contracted with the Huntsville Center to develop a history of the CEA/CMC program through its 2008 activities. That history is scheduled for completion in 2009. Much has been made of the OIF war plan's failure to anticipate both the amount of conventional munitions and how to properly dispose of the material as it was encountered. See U.S. Government Accountability Office, *Operation Iraqi Freedom: DOD Should Apply Lessons Learned Concerning the Need for Security over Conventional Munitions Storage Sites to Future Operations Planning* (Report # GAO-07-444); COL Mark D. Klingelhoefer, *Captured Enemy Ammunition in Operation Iraqi Freedom and Its Strategic Importance in Post-Conflict Operations* (Carlisle Barracks, PA: U.S. Army War College, 2005).

[4] Miller, *CJTF-7*, 17-19.

[5] The original CEA estimates proved high. However, by the end of 2007, officials revised their approximation to 500,000 tons. Klingelhoefer, *Captured Enemy Ammunition*, 2; GAO, *Operation Iraqi Freedom*, 6-7. Sargent interview.

[6] Klingelhoefer, *Captured Enemy Ammunition*, 6-7; Miller, *CJTF-7*, 18-20.

[7] GAO, *Captured Enemy Ammunition*, 11.

[8] During the first Gulf War, the Huntsville Division let and administered contracts for the Kuwait Emergency Recovery Office (KERO) and provided technical support for the Army Facilities Components Systems. See Manders, *1988-1992 Historical Update*, 95-96. For additional information regarding KERO, see McDonnell, *After Desert Storm*.

[9] Debra Valine, "Former Ordnance, Explosives Chief Lends Experience, Expertise," *Huntsville Center Bulletin* (December 2005), 8.

[10] Miller, *CJTF-7*, 21-24. Contracts included $80 million for Parsons Corporation for logistics support work, and $67 million each to the munitions management contractors EODT Technology, Inc., Tetra Tech-Foster Wheeler, Inc., and USA-Environmental, Inc.; see Zahaczewsky, "Mother of All Arsenals."

[11] Miller, *CJTF-7*, 33-47. In March 2006, administration of the International Operations Center and support services were transferred to USAE through a $20 million firm-fixed-price task order; see *Huntsville Center Bulletin* (May 2006), 1.

[12] Miller, *CJTF-7*, 57-62. For descriptions of the individual depots, see Miller, 62-68.

[13] Miller, *CJTF-7*, 57-61.

[14] Rivenburgh interview; Zahaczewsky, "Mother of All Arsenals"; Miller, *CJTF-7*, 83-87; Sargent interview; Elaine Eliah, "U.S. Contractors Work to Destroy, Recycle Munitions in Iraq," *Huntsville Center Bulletin* (December 2005), 7.

[15] Quoted in U.S. Army Engineering and Support Center, *Report to Congress*, 12.

[16] Wright and Reese, *On Point II*, 102.

[17] On 15 May 2004, Multinational Force-Iraq replaced CJTF-7.

[18] Sargent interview.

[19] HNC news release #06-012, 10 April 2006. On file at the Huntsville Center PAO.

[20] U.S. Army Engineering and Support Center, *Report to Congress*, 13-14; Miller, *CJTF-7*, 73-74. Reports provided by the munitions contractors tracked the local workforce; see USA Environmental, Inc., *Final Report Coalition Munitions Clearance: Arlington, Jaguar and Paladin Depots—Iraq* (5 January 2007), 2.6. Report provided by the U.S. Army Engineering and Support Center, Coalition Munitions Clearance Program.

[21] Zahaczewsky, "Mother of All Arsenals"; Rivenburgh interview.

Chapter 6 Changes in the Political Wind

[1] For background on the Huntsville Division's early work in U.S. Ballistic Missile Defense, see Kitchens, *History of the Huntsville Division.* For the history of the United States' quest for defense from ballistic missiles, see B. Bruce-Briggs, *The Shield of Faith: A Chronicle of Strategic Defense from Zeppelins to Star Wars* (New York: Simon and Schuster, 1988); Mark A. Berhow and Chris Taylor, *US Strategic and Defense Missile Systems 1950-2004,* Fortress, 36. (Oxford: Osprey, 2005); Lawrence M. Kaplan, *Missile Defense: The First Sixty Years* (Alexandria, VA: Missile Defense Agency History Office, 2006); Alicia Denise Jessmer, *A History of National Missile Defense and the Move Toward a More Secure US: From Nixon to George W. Bush.* MA thesis, St. Lawrence University, 2002.

[2] The term NMD originated in 1996. NMD would integrate the theater defenses with the ballistic missile defense into one organization to ensure that they used similar command and control and could be integrated on the battlefield. Before 1996, Huntsville Center worked primarily with the development of BMD.

[3] For discussions of the Huntsville Center's previous work in ABM, see Kitchens,, *A History of the Huntsville Division*; Heidish, *1977-1981 Update.*

[4] Stephen Ambrose, *Rise to Globalism: American Foreign Policy Since 1938, Sixth Edition* (New York: Penguin Books, 1991), 243-245, 345-348; Aengus David Dowley, *A Review of the*

Strategic Defense Initiative and Ballistic Missile Defenses, MS in DSS thesis, Southwest Missouri State University, 1995.

[5] "Historical Funding for MDA FY85-08." Available at http://www.mda.mil/mdalink/pdf/histfunds.pdf

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[7] MDA Historian's Office, National Missile Defense: An Overview (1993-2000), available at http://www.mda.mil/mdaLink/html/nmdhist.html.

[8] Amy F. Woolf, "National Missile Defense: Russia's Reaction" *Congressional Research Service (CRS) Reports and Issue Briefs,* Congressional Research Service (CRS) Reports and Issue Briefs, 2002. Changes in the geopolitical climate, however, rekindled interest in BMD. In late 1995, the Central Intelligence Agency released National Intelligence Estimate 95-19, "Emerging Missile Threats to North America During the Next 15 Years." The report suggested that after 15 years, other, smaller nations might have the technology to develop ballistic missiles that could threaten the United States. Based on that intelligence finding, the Clinton administration issued Program Budget Decision 224 in December 1996 and increased the Theater High Altitude Area Defense Project (THAAD) by $722 million (FY98-03) to accelerate its deployment milestone from FY06 to FY04. DCI National Intelligence Estimate President's Summary 95-19, "Emerging Missile Threats to North America During the Next 15 Years" (November 1995), available at http://www.fas.org/spp/starwars/offdocs/nie9519.htm. Theater High Altitude Area Defense Project, Defense Acquisition Executive Summary (DAES) Report, THAAD System, 25 March 1997. Available at http://handle.dtic.mil/100.2/ADA338847.

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[11] U.S. Army Engineering and Support Center, Briefing for LTG Carl A. Strock, Chief of Engineers, June 2006. On file at the Huntsville Center PAO.

[12] Huntsville Center Overview Briefing, on file at the Huntsville Center PAO.

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[17] Richard Wolffe, "Bush vows action on missile defense," *The Financial Times* (14 June 2002), 2.

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Chapter 7 For the Soldiers' Comfort

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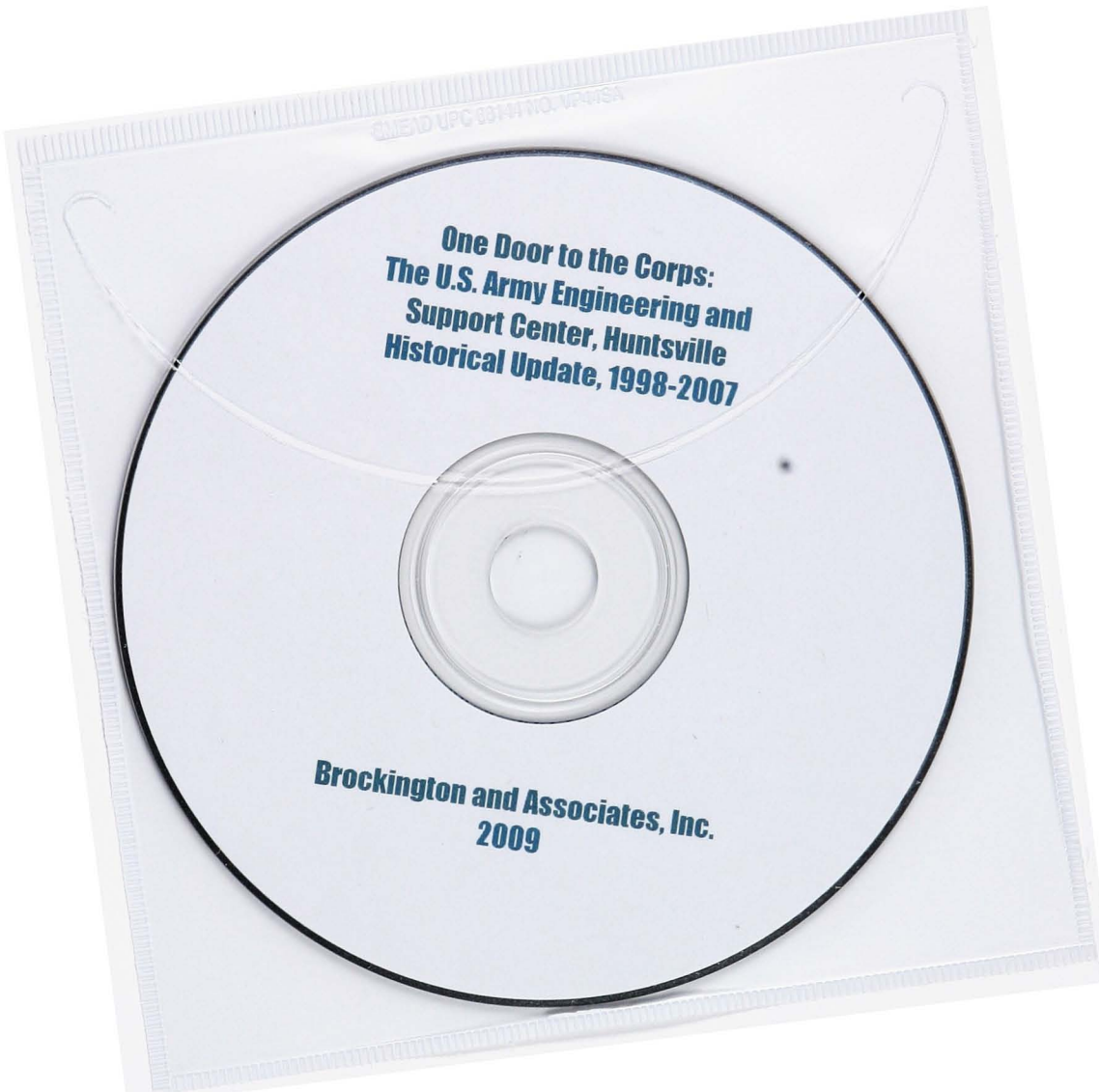
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